

GEOGRAPHY CAPSULE 2015 for SSC CGL

ORIGIN OF EARTH Nebular Theory

There are many ideas about the formation and evolution of the Solar System. The accepted idea is that 4.6 billion years ago, there was a very big cloud of gas in our area of space, known as a nebula. The Nebula eventually became so big that gravity pulled all the gas to the center. Eventually because of all the gas it became so hot there that some hydrogen atoms fused together to make helium. As they did this a lot of energy was let out. All this energy eventually made the Sun. The leftover gas and dust made the planets, their moons, asteroids and all other objects in the Solar System. Scientists think now that solar systems are created out of a huge cloud of gas. The process by which the solar systems are created is called the Nebular Theory.

THE ORIGIN OF EARTH

The formation of Earth occurred as part of the formation of the Solar System. It started as a large rotating cloud of dust and gas.

This cloud, the solar nebula, was composed of hydrogen and helium produced in the Big Bang, as well as heavier elements produced in supernovas. Then, about 4.68×10^9 years ago, the solar nebula began to contract, rotate and gain angular momentum.

This may have been triggered by a star in the region exploding as a supernova, and sending a shock wave through the solar nebula.

As the cloud rotated, it became a flat disc perpendicular to its axis of rotation. Most of the mass concentrated in the middle and began to heat up. Meanwhile, the rest of the disc began to break up into rings, with gravity causing matter to condense around dust particles. Small fragments collided to become larger fragments, including one collection about 150 million kilometers from the center: this would become the Earth.

THE LAST 2½ BILLION YEARS OR SO

As soon as the oxygen was produced by photosynthesis it was taken out again by reacting with other elements (such as iron). This continued until about 2.1 billion years ago when the concentration of oxygen increased markedly. As oxygen levels built up and then The ozone layer was formed which started to filter out harmful ultraviolet rays. This allowed the evolution of new living organisms in the shallow seas.

Earth Solar System


Earth solar system consists of :

- The Sun • The Planets
- Dwarf Planets and countless fragments of left – overs called asteroids, meteors, comets and satellites of the planets (Called small solar system Bodies).

Solar System Some Facts


- **Biggest Planet** : Jupiter
- **Smallest Planet** : Mercury

- **Nearest Planet to Sun** : Mercury
- **Farthest Planet from Sun** : Neptune
- **Nearest Planet to Earth** : Venus
- **Brightest Planet** : Venus
- **Brightest star after Sun** : Sirius
- **Planet with maximum satellites:** Jupiter
- **Coldest Planet** : Neptune
- **Hottest Planet** : Venus
- **Heaviest Planet** : Jupiter
- **Red Planet** : Mars
- **Biggest Satellite** : Gannymede
- **Smallest Satellite** : Deimos
- **Blue Planet:** Earth
- **Morning/Evening Star** : Venus
- **Earth's Twin** : Venus
- **Green Planet** : Neptune
- **Planet with a big red spot** : Jupiter
- **Lord of the Heavens** : Jupiter
- **Greatest Diurnal Temperature:** Mercury



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Earth Latitude and Longitude

Earth Latitude

- Imaginary lines drawn parallel to the equator. Measured as an angle whose apex is at the centre of the earth.
- The equator represents 0° latitude, while the North Pole is 90° N and the South Pole 90° S
- 23½° N represents Tropic of Cancer while 23½° S represents Tropic of Capricorn.

- $66\frac{1}{2}^{\circ}$ N represents Arctic Circle while $66\frac{1}{2}^{\circ}$ S represents Antarctic Circle.
- There are total 181 latitudes including the equator. Each parallel of latitude is a circle, but they are not equal.
- The circle becomes smaller towards the poles. Equator is the 'Greatest Circle' that can be drawn on the earth's surface.
- The distance between any two parallels of latitude is always equal.
1 degree lat. = 111km.

Earth Longitude

- It is the angular distance measured from the centre of the earth. On the globe the lines of longitude are drawn as a series of semicircles that extend from the North Pole to the South Pole through the equator. They are also called meridians.
- The distance between any two meridians is not equal. At the equator, 1 degree = 111 km. At 30° N or S, it is 96.5 km. It goes on decreasing this way until it is zero at the poles.
- There are 360 meridians of longitude. The prime meridian is a longitude of 0° , passing through the Royal Observatory at Greenwich near London.
- This meridian is taken by geographers to divide the earth into the eastern and the western hemispheres.
- Each meridian of longitude is a semi-circle. 180° meridian (International Date Line) lies exactly opposite to 0° meridian. Such points are called Antipodal Points.
- The earth is divided into 24 longitudinal zones, each being 15° or 1 hour apart in time (4 minutes / degree).

Longitude and Time

- Places that are on the same meridian have the same local (sun) time. Since the earth makes one complete revolution of 360° in 24 hours, it passes through 15° in one hour or 1° in 4 minutes.
- The earth rotates from west to east, hence places east of Greenwich see the sun earlier and gain time whereas places west of Greenwich see the sun later and lose time.
- India, whose longitudinal extent is approx. 30° , has adopted only one time zone, selecting the 82.5° E for the standard time which is 5 hours and 30 minutes ahead of GMT (Greenwich Mean Time).

International Date Line

- It is the 180° meridian running over the Pacific Ocean, deviating at Aleutian Islands, Fiji, Samoa and Gilbert Islands. It is a zig-zag line
- Travelers crossing the Date Line from west to east (i.e., from Japan to USA) repeat a day and travelers crossing it from east to west (i.e., from USA to Japan) lose a day.

Important Parallels of Latitude

- 1. The Tropic of Cancer** : It is in the northern hemisphere at an angular distance of $23\frac{1}{2}^{\circ}$ ($23^{\circ}30'$ N) from the equator.
 - 2. The Tropic of Capricorn** : It is in the southern hemisphere at an angular distance of $23\frac{1}{2}^{\circ}$ ($23^{\circ}30'$ S) from the equator.
 - 3. The Arctic Circle** : It lies at a distance of $66\frac{1}{2}^{\circ}$ ($66^{\circ}30'$ N) north of the equator.
 - 4. The Antarctic Circle** : It lies at a distance of $66\frac{1}{2}^{\circ}$ ($66^{\circ}30'$ S) south of the equator. There are two solstices each year, called the Summer Solstice and the Winter Solstice.
- Summer Solstice** : The day of 21st June when the sun is vertically overhead at the Tropic of Cancer ($23^{\circ}30'$ N).

Winter Solstice : The day of 22nd December when the sun is vertically overhead at the Tropic of Capricorn ($23^{\circ}30'$ S).

Meridians of Longitude

The semi-circles running from pole to pole or from north to south are known as meridians of longitude and distance between them is measured in degrees of longitude. Greenwich Meridian or Prime Meridian with a value of 0° longitude serves as a common base for numbering meridians of longitude lying on either side of it — east as well as west. There are 360 meridians including Prime Meridian. Each degree of a longitude is divided into sixty equal parts, each part is called a minute. Each minute is again divided into sixty equal parts, each part being called a second.

Local Time : Local time of any place is 12 noon when the sun is exactly overhead. It will vary from the Greenwich time at the rate of four minutes for each degree of longitude.

Greenwich Mean Time : The time at 0° longitude is called Greenwich Mean Time. It is based on local time of the meridian passing through Greenwich near London.

Indian Standard Time : It is fixed on the mean of $82\frac{1}{2}^{\circ}$ E Meridian, a place near Allahabad. It is $5\frac{1}{2}$ hours ahead of Greenwich Mean Time.

Facts about earth

- The Earth also called Blue Planet. It is the densest of all planets.
 - **Earth Circumference**: 40,232 Kilometers.
 - **Earth Area**: 510 million Square Kilometers
 - **Average distance from sun**: 149 million Kilometers.
 - **Earth Perihelion**: Nearest position of earth to sun. The earth reaches its perihelion on January 3 every year at a distance of about 147 million-Kilometers.
 - **Aphelion**: Farthest position of earth from sun. The earth reaches its aphelion on July 4, when the earth is at a distance of 152 million Kilometers.
 - The shape of the earth is oblate spheroid or oblate ellipsoid (i.e. almost spherical, flattened a little at the poles with a slight bulge at the centre).
- Types of Earth Movements:**
1. Rotation or daily movement.
 2. Revolution or annual movement.

Earth Rotation

- Spins on its imaginary axis from west to east in 23 hrs, 56 min and 40.91 sec.
- Rotational velocity at equator is 1667 Kilometers/h and it decreases towards the poles, where it is zero.

Earth's rotation results in

- i. Causation of days and nights;
 - ii. A difference of one hour between two meridians which are 15° apart;
 - iii. Change in the direction of wind and ocean currents; Rise and fall of tides everyday.
 - iv. The longest day in North Hemisphere is June 21, while shortest day is on 22 Dec (Vice-versa in S.Hemisphere).
- Days and nights are almost equal at the equator.

Earth Revolution

- It is earth's motion in elliptical orbit around the sun. Earth's average orbital velocity is 29.79 Kilometers/s.
- Takes 365 days, 5 hrs, 48 min and 45.51 sec. It results in one extra day every fourth year.

● Revolution of the earth results in

- Change of seasons
- Variation in the lengths of days and nights at different times of the year
- Shifting of wind belts
- Determination of latitudes.


Earth Eclipses

Earth Lunar Eclipse


- When earth comes between sun and moon.
- Occurs only on a full moon day. However, it does not occur on every full moon day because the moon is so small and the plane of its orbit is tilted about 5° with respect to the plane of the earth's orbit. It is for this reason that eclipses do not occur every month.
- This light is red because the atmosphere scatters the other colors present in sunlight in greater amounts than it does red.

Earth Solar Eclipse

A **solar eclipse** is a type of eclipse that occurs when the Moon passes between the Sun and Earth, and the Moon fully or partially blocks ("occults") the Sun. This can happen only at new moon

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INTERIOR STRUCTURE OF THE EARTH

The layering of Earth is categorized as Lithosphere, Asthenosphere, Upper mantle, Lower mantle, Outer core, and the Inner core.

The earth's interior has three different layers; they are
(i) the crust (ii) mantle and (iii) the core.

a) Earth's Crust:

All of the Earth's landforms (mountains, plains, and plateaus) are contained within it, along with the oceans, seas, lakes and rivers. There are two different types of crust: thin oceanic crust that underlies the ocean basins and thicker continental crust that underlies the continents. These two different types of crust are made up of different types of rock. The boundary between the crust and the mantle is Mohorovicic Discontinuity.

b) Earth's Mantle: It is the thick, dense rocky matter that surrounds the core with a radius of about 2885 km. The mantle covers the majority of the Earth's volume. This is basically composed of silicate rock rich in iron and magnesium. This layer is separated from the core by Gutenberg-Wiechert Discontinuity. The outer and the inner mantle are separated by another discontinuity named Repetti discontinuity.

c) Earth's Core: Earth's Core is thought to be composed mainly of an iron and nickel alloy. The core is earth's source of internal heat because it contains radioactive materials which release heat as they break down into more stable substances.

The core is divided into two different zones. The outer core is a liquid because the temperatures there are adequate to melt the iron-nickel alloy. However, the inner core is a solid even though its temperature is higher than the outer core. Here, tremendous pressure, produced by the weight of the overlying rocks is strong enough to crowd the atoms tightly together and prevents changing it to the liquid state.

EARTHQUAKES

- An earthquake is the sudden release of strain energy in the Earth's crust resulting in waves of shaking that radiate outwards from the earthquake source.
- The point at the surface directly above the focus is called the earthquake epicentre.
- When the earth moves in an earthquake, it can cause waves in the ocean, and if a wave grows large enough, it's called a "tsunami".
- Earthquakes are measured with a seismometer. The magnitude of an earthquake, and the intensity of shaking, is measured on a numerical scale. On the scale, 3 or less is scarcely noticeable, and magnitude 7 (or more) causes damage over a wide area. The point of origin of earthquake is called Seismic focus. The point on the earth's surface vertically above the earth's surface is called Epicentre.
- The passage of earthquake waves is recorded by Seismograph. The magnitude of waves is measured on Richter's scale. For measurement of the intensity of the earthquake (damage caused), the Modified Mercalli Intensity Scale is used.

Distribution of Earthquakes

- Around the Pacific Ocean along a belt of volcanoes known as the Ring of Fire. 68 per cent of the volcanoes are experienced in this region.
- From the middle of Asia (Himalayas, Caspian Sea) through the Mediterranean Sea to West Indies. 21 per cent earthquakes are experienced in the region.
- Mid-Atlantic ridge belt which accounts for 11 percent of the earthquakes.

TYPES OF SEISMIC WAVES

There are two types of seismic waves, body wave and surface waves.

- Body waves travel through the interior of the Earth. They follow ray paths refracted by the varying density and stiffness of the Earth's interior which in turn, vary according to temperature, composition, and phase.

Body waves are divided as

P-WAVES (Primary Waves) are compression waves that are longitudinal in nature. These waves can travel through any type of material, and can travel at nearly twice the speed of S waves.

S-WAVES (Secondary Waves) are shear waves that are transverse in nature. These waves typically follow P waves during an earthquake and displace the ground perpendicular to the direction of propagation. S waves can travel only through solids, as fluids (liquids and gases) do not support shear stresses. S waves are slower than P waves, and speeds are typically around 60% of that of P waves in any given material.

- Surface waves are analogous to water waves and travel along the Earth's surface. They travel slower than body waves.

There are two types of surface waves:

Rayleigh waves, also called ground roll, are surface waves that travel as ripples with motions that are similar to those of waves on the surface of water.

Love waves are surface waves that cause circular shearing of the ground. They are named after A.E.H. Love, a British mathematician who created a mathematical model of the waves in 1911. They usually travel slightly faster than Rayleigh waves, about 90% of the S wave velocity, and have the largest amplitude.

The asthenosphere separates the strong, solid rock of the uppermost mantle and crust above from the remainder of the strong, solid mantle below. The combination of uppermost mantle and crust above the asthenosphere is called the lithosphere. The lithosphere is free to move (glide) over the weak asthenosphere. The tectonic plates are, in fact, lithospheric plates.

Types of Waves Earthquakes

1. Primary Waves (P-Waves):
 - a) Travel from the point of happening by the displacement of surrounding particles.
 - b) They are transmitted through solids, liquids and gases.
 - c) Travels fastest.
2. Secondary Waves (S-Waves):
 - Travels through solids only.
 - Thus they cannot pass through core.
3. Surface Waves or Long Waves (L-Waves):
 - a) Travels on earth's surface and causes maximum destruction.
 - b) They are recorded after the P and S waves.

VOLCANOES

A volcano is generally a conical shaped hill or mountain built by accumulations of lava flows, and volcanic ash. About 95% of active volcanoes occur at the plate subduction zones and at the mid-oceanic ridges. Subduction is the process that takes place at convergent boundaries by which one tectonic plate moves under another tectonic plate and sinks into the mantle as the plates converge. Regions where this process occurs are known as subduction zones. The other 5% occur in areas associated with lithospheric hot spots. It is believed that hot spots are caused by plumes of rising magma that have their origin within the asthenosphere.

Types of Volcanoes

Geologists have classified five different types of volcanoes. This classification is based on the geomorphic form, magma chemistry, and the explosiveness of the eruption. The least explosive type of volcano is called a **basalt plateau**. These volcanoes produce a very fluid basaltic magma with horizontal flows. Deposits of these volcanoes can be as thick as 1800 meters. Large basalt plateaus are found in the Columbia River Plateau, western India, northern Australia, Iceland, Brazil, Argentina, and Antarctica. Some basaltic magmas can produce very large slightly sloping volcanoes, 6 to 12°, that have gently flowing magmas called shield volcanoes. **Shield volcanoes** can be up to 9000 meters tall. The volcanoes of the Hawaiian Islands are typical of this type.

A cinder cone is a small volcano, between 100 and 400 meters tall, made up of exploded rock blasted out of a central vent at a high velocity. These volcanoes develop from magma of basaltic to intermediate composition. They form when large amounts of gas accumulate within rising magma. Examples of cinder cones include Little Lake Volcano in California and Parícuti Volcano in Mexico.

Composite volcanoes are made from alternate layers of lava flows and exploded rock. Their height ranges from 100 to 3500

meters tall. The chemistry of the magma of these volcanoes is quite variable ranging from basalt to granite.

Magmas that are more granitic tend to be very explosive because of their relatively higher water content. Water at high temperatures and pressures is extremely volatile. Examples of composite volcanoes include Italy's Vesuvius, Japan's Mount Fuji, and Washington State's Mount Rainier and Mount St. Helens.

The most explosive type of volcano is the caldera.

Classification on the basis of Periodicity of Eruptions:

Active Volcano:

Volcanoes which erupt periodically. E.g. Mauna Loa in Hawaii, Etna in Sicily, Vesuvius in Italy, Stromboli in Mediterranean Sea, etc.

Dormant Volcano:

Volcanoes which has been quiet for a long time but in which there is a possibility of eruption. E.g. Fujiyama in Japan, Krakatoa in Indonesia, Barren island Volcano in Andamans, etc.

Distribution of Volcanoes in the World

About 15% of world's active volcanoes are found along the 'constructive or divergent' plate margins, whereas 80% volcanoes are associated with the 'destructive or convergent' plate boundaries.



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Earth Mountains

Types of Mountains

Fold Mountains of the World: They are formed when the rocks of the crust of the earth folded under stress, mainly by forces of compression (as a result of series of earthquakes).

E.g. – All big Mountain Systems: Himalayas, Alps, Andes, Rockies, Atlas, etc.

Old Mountains

They belong to pre-drift era, then subjected to denudation and uplift; many faults were formed; occur as relict mountains today. E.g. Pennines (Europe), Appalachians (US), Aravallis (India).

Relict Mountains: Sometimes, the mountains are carved out as a result of erosion of plateaus & high planes by various agents of erosion. E.g., Highlands of Scotland, Sierras of Spain, Catskill mountains of New York and Nilgiri, Parasnath, Girnar, Rajmahal of India.

ROCKS AND MINERALS

About 98 per cent of the total crust of the earth is composed of eight elements like oxygen, silicon, aluminium, iron, calcium, sodium, potassium and magnesium, and the rest is constituted by titanium, hydrogen, phosphorous, manganese, sulphur, carbon, nickel and other.

1) The three types of rocks are

- a) Igneous rocks (formed directly from liquid rock),
- b) Metamorphic rocks (formed by direct alteration of existing rocks), and
- c) Sedimentary rocks (formed by eroded materials from other rocks).

a) Igneous Rocks

1) Igneous rocks solidify from a liquid magma as it cools. When magma cools rapidly, mineral crystals do not have time to grow

very large. On the other hand when magma cools slowly crystals grow to several millimeters or more in size.

Granite and basalt are the examples of IR. Igneous rocks are classified as

a) Extrusive Rocks

Extrusive igneous rocks solidify from molten material that flows over the earth's surface (lava).

Common extrusive rocks are

- i) basalt,
- ii) andesite, and
- iii) rhyolite.

b) Intrusive Rocks

Intrusive rocks form from molten material (magma) that flows and solidifies underground.

Common rock types within the intrusive category are granite and diorite.

ii. Sedimentary Rocks

These are types of rocks created from deposition of layers upon layers of sediments over time. These types of rocks are formed on the Earth's surface, as well as underwater.

Examples – Sandstone, limestone, stromatolites, oil shale and coal shale, gypsum, shale, and conglomerate.

iii. Metamorphic Rocks

Metamorphic rocks are any rock type that has been altered by heat, pressure, and/or the chemical action of fluids and gases. When igneous rocks, or sedimentary rocks, or even metamorphic rocks get buried very deep under the earth's surface, a process that takes millions of years, they get changed into something else by the enormous pressure and heat inside the earth.

"Some examples of metamorphic rocks are:

- Limestone being changed into marble
- Shale turning into slate
- Granite being changed into gneiss
- Sandstone turning into quartzite

ATMOSPHERE

Atmosphere is a thick gaseous envelope that surrounds the earth and extends thousands of kilometers above the earth's surface. Much of the life on the earth exists because of the atmosphere otherwise the earth would have been barren. Nitrogen and Oxygen comprise 99% of the total volume of the atmosphere.

Structure of the Atmosphere

The atmosphere consists of almost concentric layers of air with varying density and temperature.

a) Troposphere:

- Lowest layer of the atmosphere.
- The height of troposphere is 16 km thick over the equator and 10 km thick at the poles.
- All weather phenomena are confined to troposphere (e.g. fog, cloud, frost, rainfall, storms, etc.)
- Temperature decreases with height in this layer roughly at the rate of 6.5° per 1000 metres, which is called **normal lapse rate**.
- Upper limit of the troposphere is called **tropopause** which is about 1.5 km.

b) Stratosphere:

- The stratosphere is more or less devoid of major weather phenomenon but there is circulation of feeble winds and cirrus cloud in the lower stratosphere.
- Jet aircrafts fly through the lower stratosphere because it provides perfect flying conditions.
- Ozone layer lies within the stratosphere mostly at the altitude of 15 to 35 km above earth's surface.

- Ozone layer acts as a protective cover as it absorbs ultra-violet rays of solar radiation.
- Depletion of ozone may result in rise of temperature of ground surface and lower atmosphere.
- Temperature rises from -60°C at the base of the stratosphere to its upper boundary as it absorbs ultra-violet rays.
- Upper limit of the Stratosphere is called **stratopause**.

c) Mesosphere

- Mesosphere extends to the height of 50-90 km.
- Temperature decreases with height. It reaches a minimum of -80°C at an altitude of 80-90 km
- The upper limit is called **mesopause**.

d) Thermosphere

- It lies at 80 km to 640 km above the earth's surface.
- It is also known as ionosphere.
- Temperature increases rapidly with increasing height.
- It is an electrically charged layer. This layer is produced due to interaction of solar radiation and the chemicals present, thus disappears with the sunset.
- There are a number of layers in thermosphere e.g. D-layer, E-layer, F-layer and G-layer.
- Radio waves transmitted from earth are reflected back to the earth by these layers.

e) Exosphere

- This is the uppermost layer of the atmosphere extending beyond the ionosphere.
- The density is very low and temperature becomes 5568°C.
- This layer merges with the outer space.

About Ionosphere

At heights of 80 km (50 miles), the gas is so thin that free electrons can exist for short periods of time before they are captured by a nearby positive ion. This portion of the atmosphere is ionized and contains plasma which is referred to as the ionosphere. The Ultraviolet (UV), X-Ray and shorter wavelengths of solar radiation ionizes the atmosphere. The ionosphere is broken down into the D, E and F regions.

PRESSURE AND WIND BELTS

Air pressure is thus defined as total weight of a mass of column of air above per unit area at sea level. The amount of pressure exerted by air at a particular point is determined by temperature and density which is measured as a force per unit area.

• **Aneroid Barometer**-It is the most common type barometer used in homes.

Pressure Belts of the World

a) Equatorial Low Pressure Belt:

At the Equator heated air rises leaving a low-pressure area at the surface. This low pressure area is known as **equatorial low pressure**. The zone shifts along with the northward or southward movement of sun during summer solstice and winter solstice respectively. The pressure belt is thermally induced because the ground surface gets heated during the day. Thus warm air expands, rises up and creates low pressure.

b) Sub-tropical High Pressure Belt:

The warm air risen up at the equator due to heating reaches the troposphere and bend towards the pole. Due to coriolis force the air descends at 30-35° latitude thus creates the belt of **sub-tropical high pressure**. The pressure belt is dynamically induced as it owes its origin to the rotation of the earth and sinking and settling of winds. This zone is characterized by anticyclonic conditions which cause atmospheric stability and aridity.

c) Sub-Polar Low Pressure Belt:

This belt is located between 60-65 degrees latitudes in both the hemisphere. This pressure belt is also dynamically induced. The belt is more developed and regular in the southern hemisphere than the northern due to over dominance of water in the former.

d) Polar High Pressure Belt:

High pressure persists at the pole due to low temperature. Thus the Polar High Pressure Belt is thermally induced as well as dynamically induced as the rotation of earth also plays a minor role.

Coriolis Force

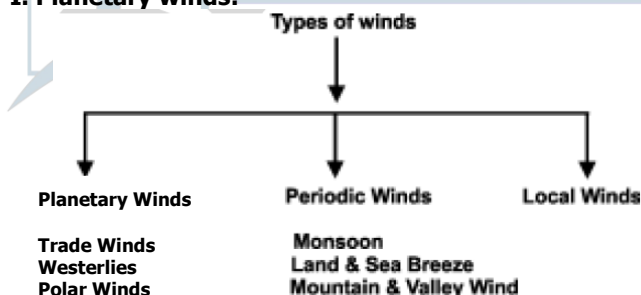
The rotation of the Earth creates force, termed Coriolis force, which acts upon wind. Instead of wind blowing directly from high to low pressure, the rotation of the Earth causes wind to be deflected off course. In the Northern Hemisphere, wind is deflected to the right of

its path, while in the Southern Hemisphere it is deflected to the left. Coriolis force is absent at the equator, and its strength increases as one approaches either pole. Furthermore, an increase in wind speed also results in a stronger Coriolis force, and thus in greater deflection of the wind.

Winds

When the movement of the air in the atmosphere is in a horizontal direction over the surface of the earth, it is known as the wind. Movement of the wind is directly controlled by pressure. Horizontally, at the Earth's surface wind always blows from areas of high pressure to areas of low pressure usually at speeds determined by the rate of air pressure change between pressure centres.

I. Planetary winds:



Planetary winds are major component of the general global circulation of air. These are known as planetary winds because of their prevalence in the global scale throughout the year. Planetary winds occur due to temperature and pressure variance throughout the world.

The planetary winds are discussed below:

(a) Trade wind

Winds blowing from the Subtropical High Pressure Belt or horse latitudes towards the Equatorial Low Pressure Belt or the ITCZ are the

trade winds. In the Northern Hemisphere, the trade winds blow from the northeast and are known as the **Northeast Trade Winds**; in the Southern Hemisphere, the winds blow from the southeast and are called the **Southeast Trade Winds**.

(b) Westerly Wind

The Westerlies are the prevailing winds in the middle latitudes between 35° and 65° latitude, blowing from the high pressure area in the Sub Tropical High Pressure Belt i.e. horse latitudes towards the sub polar low pressure belt. The winds are

predominantly from the south-west to north-east in the Northern Hemisphere and from the north-west to south-east in the Southern Hemisphere.

The Westerlies are strongest in the winter season and times when the pressure is lower over the poles, while they are weakest in the summer season and when pressures are higher over the poles. The Westerlies are particularly strong, especially in the Southern Hemisphere, as there is less land in the middle latitudes to obstruct the flow.

(c) Polar Wind

The winds blowing in the Arctic and the Antarctic latitudes are known as the Polar Winds. They have been termed the '**Polar Easterlies**', as they blow from the Polar High Pressure belt towards the Sub-Polar Low-Pressure Belts. In the Northern Hemisphere, they blow in general from the north-east, and are called the North-East Polar Winds; and in the Southern Hemisphere, they blow from the south-east and are called the South- East Polar Winds. As these winds blow from the ice-capped landmass, they are extremely cold.

They are more regular in the Southern Hemisphere than in the Northern Hemisphere.

II. Periodic Winds:

Land and sea breezes and monsoon winds are winds of a periodic type. Land and sea breezes occur daily, whereas the occurrence of monsoon winds is seasonal. Following are periodic winds:

- (a) Monsoon winds
- (b) Land and Sea Breeze
- (c) Mountain and Valley Breeze

(a) Monsoon Winds

Monsoons are regional scale wind systems that predictably change direction with the passing of the seasons. Like land and sea breezes, these wind systems are created by the temperature contrasts that exist between the surfaces of land and ocean.

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(b) Land and Sea Breezes:

A **land breeze** is created when the land is cooler than the water such as at night and the surface winds have to be very light. When this happens the air over the water slowly begins to rise, as the air begins to rise, the air over the surface of the ocean has to be replaced, this is done by drawing the air from the land over the water, thus creating a sea breeze.

A **sea breeze** is created when the surface of the land is heated sufficiently to start rising of the air. As air rises, it is replaced by air from the sea; you have now created a sea breeze. Sea breezes tend to be much stronger and can produce gusty winds as the sun can heat the land to very warm temperatures, thereby creating a significant temperature contrast to the water.

(c) Mountain and Valley winds:

Mountain-valley breezes are formed by the daily difference of the thermo effects between peaks and valleys. In daytime, the mountainside is directly heated by the sun, the temperature is higher, air expands, air pressure reduces, and therefore air will rise up the mountainside from the valley and generate a valley breeze.

III. Local Winds

These local winds blow in the various region of the world.

Hot Winds

Sirocco - Sahara Desert
Leveche - Spain
Khamsin - Egypt
Harmattan - Sahara Desert
Santa Ana - USA
Zonda - Argentina
Brick fielder - Australia

Cold Winds

Mistral - Spain and France
Bora - Adriatic coast
Pampero - Argentina
Buran - Siberia

JET-STREAMS

The JET STREAMS located in the upper troposphere (9 - 14 km) are bands of high speed winds (95-190 km/hr). The term was introduced in 1947 by Carl Gustaf Rossby. Average speed is very high with a lower limit of about 120 Kms in winter and 50 km per hours in summer. The two most important types of jet streams are the **Polar Jet Streams** and the **Subtropical Jet Streams**.

CYCLONES

Cyclones are well developed low-pressure systems surrounded by closed isobars having increasing pressure outside and closed air circulation towards the centre such that the air blows inward in anticlockwise direction in the northern hemisphere and clockwise in the southern hemisphere.

A. Tropical cyclones

Tropical cyclones are intense cyclonic storms that develop over the warm oceans of the tropics. Surface atmospheric pressure in the centre of tropical cyclones tends to be extremely low.

The main characteristics of tropical cyclones are:-

- Have winds that exceed 34 knots (39 miles/hr)
- Blow clockwise in the Southern Hemisphere and
- Counter-clockwise about their centres in the Northern Hemisphere

This is one of the most devastating natural calamities. They are known as Cyclones in the Indian Ocean, Hurricanes in the Atlantic, Typhoons in the Western Pacific and South China Sea, and Willy-Willies in the Western Australia.

B. Temperate cyclones

The systems developing in the mid and high latitude, beyond the tropics are called the middle latitude or temperate cyclones. Extra tropical cyclones form along the polar front. Two air masses of contrasting physical properties: one air mass is polar in character and is cold, denser and north-easterly in direction while the other air mass is tropical in origin and is warm, moist, lighter and south westerly in direction.

An **anticyclone** is a region of high atmospheric pressure related to the surrounding air, generally thousands of kilometres in diameter and also known as a **high** or **high-pressure system**. Winds in an anticyclone form a clockwise out-spiral in the Northern Hemisphere; whereas they form an anti-clockwise out-spiral in the Southern Hemisphere.

OCEANOGRAPHY

The study of sea floor by echo method of sound waves reveals that the sea floor is not a flat area. It consists of mountains, plateaus, plains and trenches etc. Some major submarine features are described below.

a) Continental Shelf

- 1) The portion of the land which is submerged under sea water is continental shelf.
- 2) The continental shelf is shallow and its depth is not more than 200 metres.
- 3) In all about 7.5 percent of total area of the oceans is covered by the continental shelves.

The shelves are of great use to man because:

1. Marine food comes almost entirely from them.
2. About 20 percent of oil and gas of the world is extracted from them.
3. They are the sites of productive fishing grounds.

b) Continental Slope

It is an area of steep slope extending just after the continental shelf up to a considerable depth from where a gentle sea plain takes its form. The extent of the slope area is usually between 200-2000 m. But sometimes it may extend to 3660 metres from the mean sea level. The continental slope along many coasts of the world is followed by deep canyon like trenches terminating as fan shaped deposits at the base. Continental slope covers 8.5 percent of the total ocean area.

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c) Continental Rise

- 1) The gently sloping surface at the base of the continental slope is called continental rise.
- 2) It may extend to hundreds of km into the deep ocean basin.

d) Deep Ocean Basins

It is the portion of sea floor that lies between the continental margin and the oceanic ridge system. It contains deep-ocean trenches, abyssal plains, and broad volcanic peaks called seamounts.

I. Deep-Ocean Trenches:

- a) These are long, narrow features that form the deepest parts of the ocean.
- b) Most trenches are located in the Pacific Ocean.
- c) They may reach 10,000 m deep
- d) (Mariana trench is 11,000 m below sea level in PO).

II. Abyssal Plains:

These are the most level places on Earth. The abyssal plains may have less than 3 m of relief over a distance that may exceed 1300 km. Scientists determined that abyssal plains low relief is due to the fact that thick accumulations of sediment, transported by turbidity currents, have buried rugged ocean floor.

III. Seamounts:

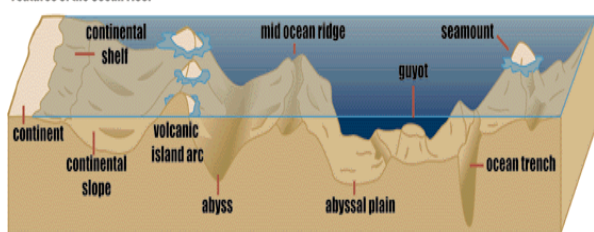
It is an isolated volcanic peak that rises at least 1000 m (3300 ft) above the deep-ocean floor.

They are more extensive in the Pacific Ocean, where subduction zones are common. These undersea volcanoes form near oceanic ridges (regions of seafloor spreading). Some of these volcanoes may emerge as an island.

e) Submarine Canyons

These are depressions with walls of steep slopes and have a V shape. They exist on the continental slopes and the shelves. They are found to have a length of 16 km at the maximum.

Features of the Ocean Floor



OCEAN CURRENTS

Ocean currents are large masses of surface water that circulate in regular patterns around the oceans. Those that flow from equatorial regions polewards have a higher surface temperature and are warm currents. Those that flow from polar regions equatorwards have a lower surface temperature and are cold currents.

Factors lead to OCEAN CURRENT

1. The planetary winds.

Between the equator and the tropics blow the Trade Winds which move equatorial waters polewards and westwards and warm the eastern coasts of continents. In the temperate latitude blow the Westerlies. Though they are less reliable than the Trade Winds, they result in a north-easterly flow of water in the northern hemisphere.

The strongest evidence of prevailing winds on current flows is seen in the North Indian Ocean. Here the direction of the currents changes completely with the direction of the monsoon winds which come from the north-east in winter and south-west in summer.

2. Temperatures.

There is much difference in the temperature of ocean waters at the equator and at the poles. As warm water is lighter and rises, and cold water is denser and sinks, warm equatorial waters move slowly along the surface polewards, while the heavier cold waters of the Polar Regions creep slowly along the bottom of the sea equatorwards.

3. Salinity.

The salinity of ocean water varies from place to place. Water of high salinity are denser than waters of low salinity. Hence waters of low salinity flow on the surface of waters of high salinity while waters of high salinity flow at the bottom towards waters of low salinity.

4. The earth's rotation.

The earth's rotation deflects freely moving objects, including ocean currents, to the right. In the northern hemisphere this is a clockwise direction (e.g. the circulation of the Gulf Stream Drift and the Canaries Current). In the southern hemisphere it is an anti-clockwise direction (e.g. the Brazilian Current and the West Wind Drift).

5. Land.

A land mass always obstructs and diverts a current. For instance, the tip of southern Chile diverts part of the West Wind Drift northwards as the Peruvian Current.

THE CIRCULATION (THE ATLANTIC OCEAN)

At the 'shoulder' of north-east Brazil, the protruding lands mass splits the South Equatorial Current into the Cayenne Current which flows along the **Guiana coast, and the Brazilian Current** which flows southwards along the east coast of Brazil. Part of the current enters the Gulf of Mexico and emerges from the Florida Strait between Florida and Cuba as the **Florida Current**. The rest of the equatorial water flows northwards east of the Antilles **to join the Gulf Stream off the south-eastern U.S.A.** The Gulf Stream Drift is one of the strongest ocean currents & hugs the coast of America as far as Cape Hatteras (latitude 35°N), where it is deflected eastwards under the combined influence of the Westerlies and the rotation of the earth. It reaches Europe as the **North Atlantic Drift**.

The cold **Labrador Current** drift southeastwards between West Greenland and Baffin Island to meet the warm Gulf Stream off Newfoundland. On reaching the west coast of Africa the current is diverted northwards as **the cold Benguela Current** (the counterpart of the Canaries Current).

THE CIRCULATION (PACIFIC OCEAN)

The North- East Trade Winds blow the **North Equatorial Current** off the coasts of the Philippines and Formosa into the East China Sea as the Kuroshio or Japan current. The cold **Bering Current or Alaskan Current** creeps southwards from the narrow Bering Strait and is joined by Okhotsk Current to meet the warm Japan Current as **the Oyashio**, off Hokkaido. The South Equatorial Current, driven by the South-East Trade winds, flows southwards along the coast of Queensland as the **East Australian Current**. Obstructed by the tip of southern

Chile, the current turns northwards along the western coast of South America as the **cold Humboldt or Peruvian Current**.

THE INDIAN OCEAN CIRCULATION

The currents of **South Indian Ocean** form a circuit. The Equatorial Current, turning southwards past Madagascar as the Agulhas or Mozambique Current merges with the West Wind Drift, flowing eastwards and turns equator-wards as the West Australian Current. In the North Indian Ocean, there is a complete reversal of the direction of currents between summer and winter, due to the changes of monsoon winds. In summer from June to October, when the dominant wind is the South-West Monsoon, the currents are blown from a south-westerly direction as the South- West Monsoon Drift. This is reversed in winter; Monsoon blows the currents from the north-east as the North-East Monsoon Drift. The currents of the North Indian Ocean, demonstrate most convincingly the dominant effects of winds on the circulation of ocean currents.

OCEANS

Arctic Ocean-- The Arctic Ocean is the smallest of the world's five oceans. The Northwest Passage (US and Canada) and Northern Sea Route (Norway and Russia) are two important seasonal waterways.

It is a body of water between Europe, Asia, and North America, mostly north of the Arctic Circle.

Lowest point: Fram Basin

Major chokepoint is the Southern Chukchi Sea

Ports and harbors: Churchill (Canada), Murmansk (Russia), Prudhoe Bay (US)



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Atlantic Ocean-- The Atlantic Ocean is the second largest of the world's five oceans. The Kiel Canal (Germany), Oresund (Denmark-Sweden), Bosphorus (Turkey), Strait of Gibraltar (Morocco-Spain), and the Saint Lawrence Seaway (Canada-US) are important strategic access waterways.

It is a body of water between Africa, Europe, the Southern Ocean, and the Western Hemisphere. **It includes** includes Baltic Sea, Black Sea, Caribbean Sea, part of the Drake Passage, Gulf of Mexico, Mediterranean Sea, and other tributary water bodies.

Lowest point: Milwaukee Deep in the Puerto Rico Trench

Major chokepoints include the Dardanelles, Strait of Gibraltar, access to the Panama and Suez Canals.

The **Equator** divides the Atlantic Ocean into the North Atlantic Ocean and South Atlantic Ocean. **Kiel Canal and Saint Lawrence Seaway** are two important waterways.

Indian Ocean

The Indian Ocean is the third largest of the world's five oceans. Four critically important access waterways are the Suez Canal (Egypt), Bab-el Mandeb (Djibouti-Yemen), Strait of Hormuz (Iran-Oman), and Strait of Malacca (Indonesia-Malaysia).

It is a body of water between Africa, the Southern Ocean, Asia, and Australia. It includes Andaman Sea, Arabian Sea, Bay of Bengal, Flores Sea, Gulf of Aden, Gulf of Oman, Java Sea, Red Sea, Strait of Malacca, Timor Sea, and other tributary water bodies.

Lowest point: Java Trench

Major chokepoints include Bab el Mandeb, Strait of Hormuz, Strait of Malacca, southern access to the Suez Canal, and the Lombok Strait.

Ports and harbors-- Colombo (Sri Lanka), Durban (South Africa), Jakarta (Indonesia), Melbourne (Australia), Richards Bay (South Africa).

Pacific Ocean

The Pacific Ocean is the largest of the world's five oceans. Strategically important access waterways include the La Perouse, Tsugaru, Tsushima, Taiwan, Singapore, and Torres Straits.

It is body of water between the Southern Ocean, Asia, Australia, and the Western Hemisphere. It includes Bali Sea, Bering Sea, Coral Sea, East China Sea, Gulf of Alaska, Philippine Sea, Sea of Japan, Sea of Okhotsk, Tasman Sea, and other tributary water bodies.

Lowest point: Challenger Deep in the Mariana Trench.

The **major chokepoints** are the Bering Strait, Panama Canal, Luzon Strait, and the Singapore Strait; the Equator divides the Pacific Ocean into the North Pacific Ocean and the South Pacific Ocean.

Ports and harbors: Bangkok (Thailand), Los Angeles (US), Manila (Philippines), Pusan (South Korea), San Francisco (US), Seattle (US), Shanghai (China), Singapore, Sydney (Australia), Vladivostok (Russia).

SOUTHERN OCEAN--The Southern Ocean is the fourth largest of the world's five oceans. It is a body of water between 60 degrees south latitude and Antarctica. It includes Amundsen Sea, Bellingshausen Sea, part of the Drake Passage, Ross Sea, a small part of the Scotia Sea, Weddell Sea, and other tributary water bodies.

Lowest point: southern end of the South Sandwich Trench.

The major chokepoint is the Drake Passage between South America and Antarctica.

Ports and harbors: McMurdo, Palmer, and offshore anchorages in Antarctica.

TIDES

The tide is the periodic rise and fall of the sea levels caused by the combined effects of the gravitational forces exerted by the Moon and Sun and rotation of the earth. Most places in the ocean usually experience two high tides and two low tides each day (semidiurnal tide), but some locations experience only one high and one low tide each day (diurnal tide). The times and amplitude of the tides at the coast are influenced by the alignment of the Sun and Moon, by the depth of the ocean, and by the shape of the coastline and near-shore bathymetry.

When the moon exerts gravitational force on the earth the tidal bulge moves out and causes high tide. Simultaneously on the side

opposite to that place on the earth i.e. just at 180° to it, also experiences the tidal bulge due to reactionary force (centrifugal) of the gravitational (centripetal) force. Thus two tides are experienced twice at every place on the earth's water surface within 24 hours.

Due to the cyclic rotation of the earth and moon, the tidal cycle is 24 hours and 52 minutes long.

Causes of Tides

- Gravitational attraction between moon and the earth.
- Gravitational attraction between sun and the earth.
- Attraction force of the earth towards earth centre.
- Moon is mainly responsible for the tides.

Types of Tides

- Semi diurnal tides - Recur at the intervals of 12½ hours.
- Diurnal Tides - Recur at the intervals of 24½ hours.
- Spring Tides - once a fortnight, due to the revolution of the moon and its declination.
- Neap tides - Once a fortnight due to the revolution and declination of moon.
- Monthly tides - Due to the revolution of the moon and its position at Perigee and Apogee.

SPRING TIDES

Spring tides are especially strong tides or high tides. They occur when the Earth, the Sun, and the Moon are in a line. The gravitational forces of the Moon and the Sun both contribute to the tides. Spring tides occur during the full moon and the new moon.

NEAP TIDES

Neap tides are especially weak tides. They occur when the gravitational forces of the Moon and the Sun are perpendicular to one another (with respect to the Earth). Neap tides occur during quarter moons.

The Bay of Fundy between Nova Scotia and New Brunswick in Canada experiences the world's greatest tidal range of 50 feet (15.25 meters)

MOUNTAINS OF INDIA

The Himalayas

Means 'Abode of Snow'. They are one of the youngest fold mountain ranges in the world and comprise mainly sedimentary rocks. They stretch from the Indus River in the west to the Brahmaputra River in the east. The Eastern Himalayas-made up of Patkai Hills, Naga Hills, Mizo Hills and the Garo, Khasi and Jaintia Hills-are also known as Purvanchal.

The Pamir, popularly known as the Roof of the World, is the connecting link between the Himalayas and the high ranges of Central Asia.

Can be divided into 3 parallel or longitudinal zones, each with separate features.

THE GREAT HIMALAYAS OR THE HIMADRI

There are few passes and almost all of them have a height above 4,500 m. They include Shipki La and Bara Lapcha La in Himachal Pradesh, Burzil and Zoji La in Kashmir, Niti, Lipulekh and Thag La in Uttarakhand, and Jelep La and Nathu La in Sikkim.

Average elevation extends upto 6000m & some of the world's highest peaks are here :

Mt Everest (or Sagarmatha or Chomo Langma)	8848 m (in Nepal)
Mt Kanchenjunga	8598 m (in India)
Mt Makalu	8481 m (in Nepal)
Mt Dhaulagiri	8172 m (in Nepal)
Mt Cho Oyu	8153m (in Nepal)
Mt Nanga Parbat	8126m (in India)

Mt Annapurna

8078 m (in Nepal)

Mt Nando Devi

7817 m (in India)

LESSER HIMALAYAS OR THE HIMACHAL

Average height of mountains is 3700 – 4500 m.

Mountains and valleys are disposed in all direction (mountains rising to 5000 m and the valleys touching 1000 m).

Its important ranges are : Dhauladhar, Pir Panjal, Nag Tibba, Mussoorie.

Outer Himalayas or The Shiwaliks

Lowest range (average elevation is 900-1200 m).

Forms the foothills and lies between the Lesser Himalayas and the plains. It is the newest range.

TRANS – HIMALAYAN ZONE

This range lies to the north of the Great Himalayas. It has some important ranges like Karakoram, Laddakh, Zaskar, etc. The highest peak in this region is K2 or Godwin Austin (8611m, in Pak occupied Kashmir). Other high peaks are Hidden Peak (8068 m), Broad Peak (8047 m) and Gasherbrum II (8035 m).

The longest glacier is Siachin in the Nubra valley, which is more than 72 km long (biggest glacier in the world). Biafo, Baltoro, Batura, Hispar are the other important glaciers in this region.

This area is the largest snow-field outside the Polar Regions.

IMPORTANT FACTS

UP borders the maximum number of States-8 (Uttarakhand, HP, Haryana, Rajasthan, MP, Chhattisgarh, Jharkhand, Bihar). After UP is Assam, which touches the border of 7 States.

Tropic of Cancer passes through 8 States : Gujarat, Rajasthan, MP, Chhattisgarh, Jharkhand, WB, Tripura, Mizoram.

Indian Standard Meridian passes through 5 States : UP, MP, Chhattisgarh, Orissa, AP.

10 States form the coast of India. They are : Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Telangana, Orissa and West Bengal.

2 Union Territories, viz. Daman & Diu and Pondicherry are also on the coast.

The Union Territories of Andaman and Nicobar Islands and Lakshadweep are made up of islands only.

THE PLAINS OF INDIA

To the south of the Himalayas and to the north of the Peninsula lies the great plains of North India. They are formed by the depositional works of three major river systems, Indus, Ganga and Brahmaputra. The vast plains of north India are alluvial in nature and the westernmost portion is occupied by the Thar Desert.

The thickness of the alluvium is maximum in the Ganga plains and minimum in the Western Plains.

The plains consist of four divisions:

Bhabar : Along the foothills of Shiwaliks. Highly porous

Tarai : Re-emergence of streams. Zone of excessive dampness

Bhangar : Older alluvium of the plains. Studded with calcareous formations called 'kankar'

Khadar : New alluvium and forms the flood plains along the river banks.

PENINSULAR PLATEAU OF INDIA

Spreads south of the Indo-Gangetic plains flanked by sea on three sides. This plateau is shaped like a triangle with its base in the north. The Eastern Ghats and the Western Ghats constitute its eastern and western boundaries, respectively.

Narmada, which flows through a rift valley, divides the region into two parts: The Malwa Plateau in the north & the Deccan Plateau in the south.

Vindhya Plateau is situated south of Malwa plateau.

Chhota Nagpur Plateau lies to the west of Bengal basin, the largest and most typical part of which is the Ranchi plateau.

The Deccan Plateau is the largest plateau in India. It is made up of lava flows in the Cretaceous-Eocene era through the fissure eruptions.

ISLANDS OF INDIA

Total coastline of India : 7516 km. Longest coastline: Gujarat (Second longest is of Andhra Pradesh).

Indian territorial limits include 248 islands:

The Andaman and Nicobar Group

Andamans is a group of 204 islands of which the largest is Middle Andaman. The Andamans are believed to be extensions of mountains system in the N.E. part of the country.

Saddle Peak (737 m) in N. Andaman is the highest peak.

The Nicobars is a group of 19 islands of which the largest is Great Nicobar. Most of them are volcanic in nature. Great Nicobar is the southernmost island and is only 147 km away from Sumatra island of Indonesia.

Volcanic Islands: Barren and Narcondam Islands. Barren is in the process of eruption these days after lying dormant for 200 years.

The Arabian Sea Group

All the islands in the Arabian Sea (Total 25) are coral islands and are surrounded by Fringing Reefs (North : Lakshadweep, South: Minicoy).

DO YOU KNOW?

Ten Degree Channel separates Andamans from Nicobars (Little Andaman from Car Nicobar)

Duncan Passage lies between South Andaman and Little Andaman.

Nine Degree Channel separates Kavaratti from Minicoy Island.

Eight Degree Channel separates Minicoy Island (India) from Maldives.

RIVERS OF INDIA

In India, the rivers can be divided into two main groups:

Himalayan Rivers--1) Indus 2) Ganga 3) Brahmaputra

Peninsular Rivers--1) East flowing 2) West flowing

HIMALAYAN RIVERS OF INDIA

THE INDUS SYSTEM

It has a total length of 2880 km (709 km in India). Rises in Tibet (China) near Mansarovar Lake. In Jammu and Kashmir, its Himalayan tributaries are: Zaskar, Dras, Gartang, Shyok, Shigar, Nubra, Gilgit, etc. Its most important tributaries, which join Indus at various places, are: Jhelum, Chenab (1800 km), Ravi, Beas & Satluj.

Sources: Jhelum from Verinag (SE Kashmir), Ravi from Kullu Hills near Rohtang Pass in Himachal Pradesh, Beas from a place near Rohtang Pass in Himachal Pradesh and Satluj from Mansarovar – Rakas lakes in W. Tibet.

THE GANGA SYSTEM

It is 2525 km long of which 1450 km is in Uttarakhand and UP, 445 km in Bihar and 520 km in West Bengal. The Ganga, the

head stream is constituted of two main rivers – Bhagirathi and Alaknanda, which combine at Devprayag to form Ganga.

Sources: Bhagirathi from Gaumukh, Alaknanda from Badrinath, Mandakini from Kedarnath (all from Uttarakhand).

Yamuna (1375 km) is its most important tributary (on right bank). It rises at the Yamunotri glacier in Uttarakhand. It runs parallel to Ganga for 800km and joins it at Allahabad. Important tributaries of Yamuna are Chambal, Betwa (480 km) and Ken (all from south).

Apart from Yamuna, other tributaries of Ganga are Ghaghra (1080 km), Son (780 km), Gandak (425 km), Kosi (730 km), Gomti (805 km), Damodar (541 km). Kosi is infamous as 'Sorrow of Bihar', while Damodar gets the name 'Sorrow of Bengal' as these cause floods in these regions. Hooghly is a distributary of Ganga flowing through Kolkata.

THE BRAHMAPUTRA SYSTEM

It has a total length of 2900 km. It rises in Tibet (from Chemayungdung glacier), where it is called Tsangpo, and enters the Indian territory (in Arunachal Pradesh) under the name Dihang. Important Tributaries: Subansiri, Kameng, Dhansiri, Manas, Teesta. In Bangladesh, Brahmaputra is known by the name of Jamuna while Ganga gets the name Padma. Their combined stream is known as Padma only. Meghna is the most important distributary before it enters the Bay of Bengal.

The combined stream of Ganga and Brahmaputra forms the biggest delta in the world, the Sundarbans, covering an area of 58,752 sq. km. Its major part is in Bangladesh.

On Brahmaputra is the river island, Majuli in Assam, the biggest river island in the world.

Brahmaputra, or the Red River, is navigable for a distance of 1384 km up to Dibrugarh and serves as an excellent inland water transport route.

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RIVERS OF THE PENINSULA IN INDIA

A. EAST FLOWING RIVERS OF INDIA (OR DELTA FORMING RIVERS)

Mahanadi River (858 km) : Rises in Raipur distt. in Chhatisgarh. **Godavari River (1465 km) :** Also called Vriddha Ganga or Dakshina Ganga. It is the longest peninsular river. Rises in Nasik. Main tributaries: Manjra, Penganga, Wardha, Indravati, Wainganga, etc.

Krishna River (1327 km) : Rises in Western Ghats near Mahabaleshwar. Main tributaries: Koyna, Dudhganga, Panchganga, Malprabha, Bhima, Tungabhadra, etc.

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Cauvery River (805 km) : It is the largest peninsular river (maximum amount of water). Infact, it is the only peninsular river which flows almost throughout the year. Known as the 'Ganga of the South'. It rises from the Brahmagir range of Western Ghats. Main tributaries: Hemavati, Lokpawni, Shimsa.

Swarnarekha River (395 km) and Brahmani (705 km) : Rises from Ranchi Plateau.

B. WEST FLOWING RIVERS IN INDIA

Narmada River (1057 km) : Rises in Amarkantak Plateau and flows into Gulf of Khambat. It forms the famous Dhuandhar Falls near Jabalpur. Main tributaries: Hiran, Burhner, Banjar, Shar, Shakkar, Tawa, etc.

Tapti River (724 km) : Rises from Betul distt in Maharashtra. Also known as twin or handmaid of Narmada. Main tributaries: Purna, Betul, Arunavati, Ganjal, etc.

Sabarmati River (416 km) : Rises from Aravallis in Rajasthan.

Mahi River (560 km) : Rises from Vindhyas in Maharashtra.

Luni River (450 km) : Rises from Aravallis. Also called Salt River. It is finally lost in the marshy grounds at the head of the Rann of Kutch.

Sharavati is a west flowing river of the Sahyadris. It forms the famous Jog or Gersoppa or Mahatma Gandhi Falls (289 m), which is the highest waterfall in India.

Note: The largest man-made lake in India is Indira Sagar Lake, which is the reservoir of Sardar Sarovar Project, Onkareshwar Project and Maheshwar Project in Gujarat-MP.

Chilka Lake (Orissa) is the largest brackish water lake of India. Otherwise also, it is the largest lake of India.

Wular Lake (J & K) is the largest fresh water lake of India. Dul Lake is also there in J & K. From Sambhar and Didwana Lake (Rajasthan), salt is produced. Other important lakes are Vembanad in Kerala and Kolleru & Pulicat in Andhra Pradesh.

The three important Gulfs in the Indian Territory are:

Gulf of Kutch (west of Gujarat) : Region with highest potential of tidal energy generation

Gulf of Cambay or Gulf of Khambat (Gujarat) : Narmada, Tapti, Mahi and Sabarmati drain into it.

Gulf of Mannar (south east of Tamil Nadu) : Asia's first marine biosphere reserve.

IMPORTANT RIVER VALLEY PROJECTS IN INDIA

- **Bhakra Nangal Project**: On Satluj in Punjab. Highest in India. Ht 226 m. Reservoir is called Gobind Sagar Lake
- **Mandi Project**: On Beas in H.P
- **Chambal Valley Project**: On Chambal in M.P & Rajasthan. 3 dams are there: Gandhi Sagar Dam, Rana Pratap Sagar Dam and Jawahar Sagar Dam
- **Damodar Valley Project**: On Damodar in Bihar.
- **Hirakud**: On Mahanadi in Orissa. World's longest dam: 4801 m
- **Rihand** : On Son(river) in Mirzapur. Reservoir is called Govind Vallabh Pant Reservoir
- **Mayurkashi Project** : On Mayurkashi in W.B
- **Kakrapar Project** : On Tapi in Gujarat
- **Nizamsagar Project**: On Manjra in A.P

- **Nagarjuna Sagar Project** : On Krishna in A.P
- **Shivasamudram Project**: On Cauvery in Karnataka
- **Tata Hydel Scheme** : On Bhima in Maharashtra
- **Sharavathi Hydel Project** : On Jog Falls in Karnataka
- **Kundah & Periyar Project** : In TN
- **Farakka Project**: On Ganga in W.B. Apart from power and irrigation it helps to remove silt for easy navigation
- **Ukai Project** : On Tapti in Gujarat
- **Salal Project** : On Chenab in J & K
- **Mata Tila Multipurpose Project**: On Betwa in U.P & M.P
- **Thein Project** : On Ravi, Punjab
- **Pong Dam** : On Beas, Punjab

Climate of INDIA

India has tropical monsoon type of climate.

CLIMATE SEASONS IN INDIA

In India, the year can be divided into four seasons, resulting from the monsoons which occur mainly due to the differential heating of land and movement of the sun's vertical rays.

The highest temperature experienced in South is in April while in North it is in May and June. '**Cherry Blossoms**' are there in Karnataka, beneficial to coffee plantation and '**Mango showers**' in elsewhere South India, which are beneficial to mango crops.

The south – west monsoon enters the country in two currents, one blowing over the Bay of Bengal and the other over the Arabian Sea. This monsoon causes rainfall over most of the country (except Tamil Nadu and Thar Desert area).

The Bay of Bengal branch after crossing the deltaic region enters the Khasi valley in Meghalaya and gets entrapped in it due to funnel shape of the region. It strikes Cherrapunji in a perpendicular direction causing heavy rainfall in Mawsynram (Approx. 1400 cm). From mid-Sept to mid-Dec, the monsoon retreats. As the sun's vertical rays start shifting towards the Tropic of Capricorn, the low pressure area starts moving south and winds finally start blowing from land to sea. This is called **north-east monsoon**. The withdrawal of monsoon is a much more gradual process than its onset. It causes rainfall in Tamil Nadu as the winds pick some moisture from Bay of Bengal. This explains the phenomenon why Tamil Nadu remains dry when the entire country receives rain and why it gets rain when practically the entire country is dry.

CLIMATIC REGIONS OF INDIA

India can be divided into a number of climatic regions.

Tropical Rain Forests in India : Found in the west coastal plains, the Western Ghats and parts of Assam. Characterised by high temperatures throughout the year. Rainfall, though seasonal, is heavy- about 200 cm annually during May-November.

Tropical Savanna Climate : In most of the peninsula region except the semi-arid zone in the leeward side of the Western Ghats. It is characterized by long dry weather throughout winter and early summer and high temperature (above 18.2 Deg.c); annual rainfall varies from 76 cm in the west to 150 cm in the east.

Tropical Semi-Arid Steppe Climate : It prevails in the rain-shadow belt running southward from Central Maharashtra to Tamil Nadu in the leeward side of the Western Ghats and the Cardamom Hills. It is characterized by low rainfall which varies from 38 cm to 80 cm, high temperature between 20 and 30.

Tropical and Subtropical Steppes : Large areas in Punjab, Haryana and Kutch region. Temperature varies from 12-35 Deg.

c. The maximum temperature reaches up to 49 Deg.c. The annual rainfall, varying from 30.5-63.5 cm, is also highly erratic.

Tropical desert : This climate extends over the western parts of Banner, Jaisalmer and Bikaner districts of Rajasthan and parts of Kutch. It is characterized by scanty rainfall (30.5 cm), which is highly erratic. Rains are mostly in the form of cloudburst. Mean monthly temperature is uniformly high (about 35c).

Humid Subtropical Climate with Dry Winters : This area includes south of the Himalayas, east of the tropical and subtropical steppes and north of tropical savannah. Winters are mild to severe while summers are extremely hot. The annual rainfall varies from 63.5 cm to more than 254 cm, most of it received during the south west monsoon season.

Mountain Climate : Such type of climate is seen in mountainous regions which rise above 6,000 m or more such as the Himalayas and the Karakoram Range.

Factors Affecting India's Climate

Latitude: The Indian landmass is equally divided by The Tropic of Cancer. Hence, half of India has tropical climate and another half has subtropical climate.

Altitude: While the average elevation in the coastal areas is about 30 metre, the average elevation in the north is about 6,000 metre. The Himalayas prevent the cold winds from Central Asia from entering the Indian subcontinent. Due to this, the subcontinent gets comparatively milder winters as compared to Central Asia.

Pressure and Winds: The Indian subcontinent lies in the region of north-easterly winds. These winds originate from the subtropical high-pressure belt of the northern hemisphere. After that, these winds blow towards south. They get deflected to the right due to the Coriolis force and then move towards the low pressure area near the equator.

Soils

1. Alluvial Soil:

In India it covers about 40 per cent of the total land area. It is very fertile and contributes the largest share of agricultural wealth.

Found mostly in the Northern Plains, starting from Punjab in the west to West Bengal and Assam in the east.

The northern parts and the coastal areas of Gujarat also have some deposits of alluvial soil.

The fine particles of sand, silt and clay are called alluvium.

The alluvial soil can be divided into

a. Old alluvium, called bangar

b. New alluvium, called khadar.

Alluvial soil is most suited to irrigation and can produce bumper crops of rice, wheat, maize, sugarcane, tobacco, cotton, jute, oilseeds, etc.

2. Black Soil:

The black soil is locally called regur, a word derived from Telugu word 'reguda'.

It is also called the Black Cotton Soil, as cotton is the most important crop grown in this soil.

The black soil is mostly found in the Deccan Trap, covering large areas of Maharashtra, Gujarat and western Madhya Pradesh.

The black soil is well-known for its capacity to hold moisture.

Black soil is widely used for producing cotton, wheat, linseed, millets, tobacco and oilseeds.

3. Red Soil:

The red soil occupies about 10 per cent area of India, mostly in the south-eastern part of the Peninsular India.

The red soil is found in Tamil Nadu, parts of Karnataka, southeast Maharashtra, eastern parts of Andhra Pradesh, Madhya Pradesh, Orissa and Jharkhand.

The red colour is due to the high percentage of iron contents.

This soil is rich in potash, but poor in lime, phosphate, nitrogen and humus.

Red soils can give excellent yields of cotton, wheat, rice, pulses, millets, tobacco, oilseeds, etc.

4. Laterite Soil:

The word 'laterite' has been derived from a Latin word meaning 'brick'.

It is mainly found on the summits of the Western Ghats, Eastern Ghats, Rajmahal Hills, Vindhya, Satpuras and Malwa plateau. It is well-developed in southern Maharashtra, and parts of Orissa, West Bengal, Karnataka, Andhra Pradesh, Kerala, Bihar, Assam and Meghalaya.

Such climatic conditions promote leaching of soil. Leaching is a process in which heavy rains wash away the fertile part of the soil. The laterite soil is red in colour and composed of little clay and much gravel of red sandstones.

Due to intensive leaching, the laterite soil generally lacks fertility and is of low value for crop production.

But when manured and timely irrigated, the soil is suitable for producing plantation crops like tea, coffee, rubber, coconut, arecanut, etc.

5. Mountain Soil:

The mountain soil is generally found on the hill slopes covered with forests.

This soil is also found in the Western and Eastern Ghats and in some parts of the Peninsular India.

This soil is rich in humus, but poor in potash, phosphorus and lime.

In the Himalayan region wheat, maize, barley and temperate fruits are grown on this soil.

This soil is especially suitable for producing plantation crops, such as tea, coffee, spices and tropical fruits in Karnataka, Tamil Nadu and Kerala.

6. Desert Soil:

The desert soil is found mostly in the arid and semi-arid regions, receiving less than 50 cm of annual rainfall.

Such regions are mostly found in Rajasthan and the adjoining areas of Haryana and Punjab.

The Rann of Kachchh in Gujarat is an extension of this region.

The desert soil has sand (90 to 95 per cent) and clay (5 to 10 per cent). Desert soil can produce a variety of crops, such as wheat, millets, barley, maize, pulses, cotton, etc.



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NATURAL VEGETATION IN INDIA

Tropical Wet Evergreen Forests--In areas over 250 cm rainfall. In Western Ghats, hilly areas in N.E. India and Andaman and Nicobar Islands. Trees are rosewood, shisham, ebony, ironwood, etc.

Tropical Moist Deciduous Forests--In areas having rainfall between 100 – 200 cm. In peninsular region and along the foothills of Himalayas in Shivaliks, Bhabhar and Tarai. The trees of these forests drop their leaves for about 6-8 weeks during the spring and early summer when sufficient moisture isn't available.

Trees are teak, sal, bamboo, sandalwood, rosewood, etc.

Thorn Forests

In areas having rainfall between 25 and 80 cm. In arid regions of Rajasthan, Punjab, Haryana and Gujarat. Trees are palm, acacia, etc.

HILL FORESTS---In hills of Southern India and the Himalayas.

The type of trees depends upon the height of the mountain : Sal and bamboo below 1000 m; oaks, chestnuts and other fruit trees, and chir forests between 1000 and 2000 m; pine, deodar, silver fern and spruce between 1600 and 3300 m; above 3600 m alpine forests with trees like silver firs, pines, birches, etc. Alpine forests give way to Alpine grasslands and scrubs as we move up further.

Tidal or Mangrove Forests

Also known as Littoral or Swamp Forests. Occur along the sea coast and in the estuaries of rivers, especially in Sunderbans and the Andamans. Most important tree is Sundari. It provides hard and durable timber which is used for construction and building purposes as well as for making boats.

IMPORTANT POINTS

Madhya Pradesh has the largest area under forests. As per percentage of forest area to total area, first is Andaman and Nicobar Islands, followed by Mizoram. In Mangrove forests, West Bengal holds the first position, followed by Gujarat and Andaman and Nicobar Islands.

The lowest forest percentage is in Haryana and Punjab, because of the extensive agriculture.

BIOSPHERE RESERVES IN INDIA

In India, the first biosphere reserve – Nilgiri biosphere reserve – came into being in 1986. So far, 14 biosphere reserves have been set up in the country.

NATIONAL PARKS AND WILD LIFE SANCTUARIES

There are 96 National Parks and 510 Wildlife Sanctuaries in India.

Madhya Pradesh and Andaman and Nicobar Islands have the maximum number of National Parks (9 each) while Andaman and Nicobar Islands has 96 and Maharashtra has 36 Wildlife Sanctuaries (maximum in India).

CROPPING SEASONS IN INDIA

Kharif Crops of India

Sown in summers between May and July, and harvested after the rains, in September and October.

Eg: Rice, Jowar, Bajra, Maize, Cotton, Jute, Sugarcane, Tobacco, Groundnut, Pulses, etc.

Rabi Crops of India

Sown at the beginning of winter and harvested before the onset of the summer season, between Feb and April.

Eg: Wheat, barley, oilseeds, gram, potatoes, etc.

Zaid Crops

They are raised between April and June.

E.g. : Melon, watermelon, cucumber, toris, leafy and other vegetables.

Cash Crops of India (Commercial Crops)

Grown mainly for the market, only a small portion of the product is consumed by the farmers themselves (cotton, sugarcane etc.)

CASH CROPS

Sugarcane

Cotton

In UP, Maharashtra, Karnataka
In Maharashtra, Gujarat, Andhra Pradesh

Jute & Mesta

In WB, Bihar, Asom

Tea

Coffee Rubber Silk

In Asom, West Bengal, Himachal Pradesh
In Kamalaka, Kerala, Tamil Nadu
In Kerala, Tamil Nadu, Karnataka
In Karnataka, Jammu and Kashmir, Andhra Pradesh. In India all 4 varieties of silk are available: Mulberry, tussar, eri and muga. Mulberry is the main variety, while tussar is mainly found in Bihar. In Gujaral, Andhra Pradesh, Karnataka

Tobacco

Jhum

Shifting type of cultivation practiced in the hill slopes of Asom, Arunachal Pradesh, Mizoram and Nagaland. In this, the trees are felled and set on fire. The ash of the burnt trees and the other vegetation adds to the fertility of soil. This land is used for 2-3 years till the soil gets exhausted and the jhum is abandoned.

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RAILWAYS IN INDIA

Indian railway system is the largest in Asia and the fourth largest in the world. It is the biggest departmental public undertaking in the country. The first train ran in India between Bombay and Thane, a stretch of 34 km. on April 16th 1853.

The second train ran between Howrah and Hooghly in 1854.

The headquarters of Indian Railway is in New Delhi.

The first electric train in India was 'Deccan Queen'. It was introduced in 1929 between Bombay and Poona.

Indian Railways has the second biggest electrified system in the world after Russia.

The fastest train in India is the Shatabadi Express whose maximum speed is 140 km/hr.

The total route covered is approx 63,000 km.

The total number of railway stations in India is 7,100.

The longest railway platforms are: Gorakhpur railway station, Uttar Pradesh, India: 1,366.33 m (4,483 ft) (longest in the world).

Mumbai is the destination where maximum number of trains in India head for.

The first Metro Rail was introduced in Kolkata (W.Bengal) on October 24, 1984. The two stations connected were Dumdum and Belgachhia.

Konkan Railways India : It is a project to shorten the distance between Maharashtra, Goa and Karnataka. The total route length is 786 km between Apta (Maharashtra) and Mangalore (Karnataka).

Water Transport in India

The total length of navigable waterways in Indian comprising rivers, canals, backwaters, etc, is 14,500 km out of which 3700 km is navigable by mechanised boats.

The government has recognised the following National Waterways of India:

NW 1: Allahabad to Haldia – 1,629 kms

NW 2: Sadia to Dhubari (on Brahmaputra river) – 819 kms

NW 3: Kollam to Kottapuram – 186 kms

NW 4: Kakinada to Marakkanam (Along Godawari and Krishna river) – 1,100 kms

Ports in India

The Waterways Authority in India divides Indian ports into three categories, major, minor and intermediate. India has about 190 ports in all, with 12 major and the rest intermediate and minor.

The 12 Major Ports are:

Port	State
Kolkata (including Haldia)	West Bengal
Paradip	Orissa
Vishakhapatnam	Andhra Pradesh
Chennai	Tamil Nadu
Ennore	Tamil Nadu
Tuticorin	Tamil Nadu
Cochin	Kerala
New Mangalore	Karnataka
Mormugao	Goa
Jawaharlal Nehru	Maharashtra
Mumbai	Maharashtra
Kandla	Gujarat

BOUNDARY LINES

LINES

Durand Line	Pakistan & Afghanistan
MacMohan Line	India & China
Radcliffe Line	India & Pakistan
Maginot Line	France & Germany
Oder Niesse Line	Germany & Poland
Hindenberg Line	Poland & Germany (at the time of First World War)
38th Parallel	North & South Korea
49th Parallel	USA & Canada

MINERALS IN INDIA

1. IRON :

Iron is found in the earth's surface in its crude form known as iron-ore. India has huge deposits of iron-ore in Bihar, Orissa, Madhya

Pradesh, Karnataka and Maharashtra. Iron-ore is found in the mines at Singhbhum in Bihar and Mayurbhanj in Orissa.

Steel is obtained by alloying iron with manganese. We have big steel plants at Jamshedpur, Bhilai, Bokaro, Durgapur, Rourkela and Bhadravati.

2.COAL :

It is known as 'black diamond'. Products like nylon, chemicals, dyes, drugs and perfumes are obtained from the distillation of coal. Coal is found in Bihar, West Bengal, Damodar Valley, Orissa, Andhra Pradesh and Madhya Pradesh. Jharia in Bihar and Raniganj in West Bengal are the largest coal mines in India. Other coal mines are located at Suhagpur (Madhya Pradesh) Dhanbad (Bihar) Neyveli (Tamil Nadu) and Singarani (Andhra Pradesh).

3. PETROLEUM :

Petroleum is known as 'black gold'. Petroleum is found at Digboi in Assam, Ankaishwar and Kalol in Gujarat and Bombay High off the shore of Bombay. The petroleum produced in India is not sufficient to meet our requirements.

4. MANGANESE :

Manganese is used in the manufacture of steel. India is one of the largest producers of manganese in the world. It is found in Orissa, Karnataka, Madhya Pradesh and Maharashtra.

5. MICA :

It is a bad conductor of electricity. It is used as insulator in making electrical goods like radio sets and wireless sets. India is the largest producer of mica in the world. Its huge deposits are found in Gaya, Monghyr and Hazaribagh districts of Bihar. Mica is also found in large quantities in Andhra Pradesh and Rajasthan. A large quantity of mica is exported to other countries.

6. ALUMINIUM :

It is a light but hard metal. The ore from which aluminum is produced is known as bauxite. Huge deposits of bauxite are found in Bihar, Orissa, Madhya Pradesh, Andhra Pradesh, Karnataka, Tamil Nadu and Maharashtra.

7. COPPER :

It is a good conductor of electricity. It alloys with zinc to form brass and with tin to form bronze. It occurs in small quantities in India. It is found at Khetri in Rajasthan. Some copper has been found in Andhra Pradesh, Uttar Pradesh and Tamil Nadu.

8. GOLD :

Gold is produced from the mines at Kolor and Hutti in Karnataka and Anantapuram in Andhra Pradesh.

9. DIAMOND :

Diamonds are found in the mines at Panno in Madhya Pradesh

OTHER TOPICS:

THE KOPPEN CLIMATE CLASSIFICATION SYSTEM

The Koppen system is strictly empirical. This is to say that each climate is defined according to fixed values of temperature and precipitation, computed according to the averages of the year or of individual months. Air temperature and precipitation are the most easily obtainable surface weather data, requiring only simple equipment and a very elementary observer education. A climate system based on these data has a great advantage, in that the area covered by each sub-type of climate can be delineated (outlined, profiled) for large regions of the world.

Five major climate groups are designated by capital letters as follows:

A—Tropical Rainy Climate: Average temperature of every month is above 64.4 Deg.F (18 Deg.C). These climates have no winter season. Annual rainfall is large and exceeds annual evaporation.

B—Dry Climate: Potential evaporation exceeds precipitation on the average throughout the year. No water surplus; hence no permanent streams originate in B Climate Zones.

C—Mild, Humid (Meso-thermal) Climates: Coldest month has an average temperature under 64.4 Deg.F (18 Deg.C), but above 26.6 Deg.F (-3 Deg.C); at least one month has an average temperature above 50°F (10 Deg.C). The sea climates have both a summer and a winter season.

D— Snowy Forests (Micro-thermal) Climates: Coldest month has an average temperature under 26.6 Deg.F. Average temperature of warmest month is above 50 Deg.F.

E—Polar Climates: The average temperature of warmest month is below 50 Deg.F. The climates have no true summer.

Sub-Groups

Sub-groups within the five major groups are designated by a second letter, according to the following codes:-

S – Steppe Climate: A semi-arid climate with about 15-30 inches (38-76 cm) of rainfall annually at low latitudes.

W – Desert Climate: Arid climate. Most regions included have less than 10 inches (25 cm) of rainfall annually.

The letters S and W are applied only to the dry B climates, yielding two combinations – BS and BW.

f:- Moist. Adequate precipitation in all months. No dry season. This modifier is applied to A, C and D groups, yielding combinations – Af, Cf and Df.

w:- Dry season in the winter of the respective hemisphere (low sun season). This modifier is applied to A, C and D groups, yielding combinations – Aw, Cw and Dw.

s:- Dry season in the summer of the respective hemisphere (high sun season).

m:- Rainforest climate. Despite short, dry season in monsoon type of precipitation cycle. Applies to only A climates (Am).

Types of Climates

From the combination of the two letter groups, twelve distinct climates emerge as follows:

Tropical Rainforest Climate (Af): Rainfall of the driest month is 6 cm or more.

Monsoon variety of Af (Am): Rainfall of the driest month is less than 6 cm. The dry season is strongly developed.

Tropical Savanna Climate (Aw): At least one month has rainfall less than 6 cm. The dry season is strongly developed.

Steppe Climate (BS): A semi-arid climate characterized by grasslands. It occupies an intermediate position between the



desert climate "BW" and the more humid climates of A, C and D groups.

Desert Climate (BW): An arid climate with annual precipitation usually less than 40 cm.

Mild Humid Climate with no dry season (Cf): Temperate rainy climate, moist in all seasons. Precipitation of the driest month averages more than 3 cm.

Mild Humid Climate with a dry winter (Cw): Temperate rainy climate with dry winter. The wettest month of summer has at least 10 times the precipitation of the driest month of winter or 70% or more of the mean annual precipitation falls in the warmer six months.

Mild Humid Climate with a dry summer (Cs): Temperate rainy climate with dry summer. Precipitation of the driest month of summer is less than 3 cm. Precipitation of the wettest month of winter is at least 3 times as much as that of the driest month of summer or 70% or more of the mean annual precipitation falls in the six months of winter.

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Snowy Forest Climate with a moist winter (Df): Cold snowy forest climate with moist in all seasons.

Snowy Forest Climate with a dry winter (Dw): Cold snowy forest climate with dry winter.

Tundra Climate (ET): Mean temperature of the warmest month is above 0°C, but below 10°C.

Perpetual Frost Climate (EF): Ice-sheet climate. Mean monthly temperatures of all months are below 0°C.

Area Geography & Boundaries OF INDIA

1. India stretches 3,214 km from North to South & 2,933 km from East to West.
2. Geography Area of India : 32,87,263 sq. km. Accounts for 2.4% of the total world area and roughly 16% of the world population.
3. Mainland India has a coastline of 6,100 km. Including the Lakshadweep and Andaman and Nicobar Islands, the coastline measures about 7516.6 km.
4. In India, of the total land mass:
 - Plains Geography: 43.3%
 - Plateaus: 27.7% • Hills: 18.6%
 - Mountains Geography: 10.7%
5. In the South, on the eastern side, the Gulf of Mannar & the Palk Strait separate India from Sri Lanka.

6. Total land neighbours: 7 (Pakistan, Afghanistan, China, Nepal, Bhutan, Bangladesh and Myanmar).

7. India's Islands include the Andaman & Nicobar Islands in Bay of Bengal and Lakshadweep, Minicoy & Amindive Islands in the Arabian Sea.

INDIA FACTS

- Highest Award-Bharat Ratna
- Highest Gallantry Award-Param Vir Chakra
- Longest Tributary river of India-Yamuna
- Largest Lake-Wular Lake, Kashmir
- Largest Lake (Saline Water)-Chilka Lake, Orissa
- Largest Man-Made Lake-Govind Vallabh Pant Sagar (Rihand Dam)
- Highest Lake-Devtal Lake, Gadhwal (Uttarakhand)
- Highest Peak-Karakoram-2 of K-2 (8,611 meters)
- Largest Populated City-Mumbai
- Largest State(Area)-Rajasthan
- Largest State(Population)-Uttar Pradesh
- Highest rainfall-Cherrapunji (426 inches per annum)
- State wise largest area under forest-Madhya Pradesh
- Largest Delta-Sunderbans Delta
- Longest River Bridge-Mahatma Gandhi Setu, Patna
- Biggest Cave temple-Ellora
- Longest Road-Grand Trunk Road
- Longest Canal-Indira Gandhi Canal or Rajasthan Canal (Rajasthan)
- Largest Museum-India Museum at Kolkata
- Longest Dam-Hirakud Dam (Orissa)
- Highest Dam-Tehri Dam (260 meters , 850 ft)
- Largest District-Kutch district
- Longest Highway NH-44 (NH-7) which turns from Varanasi to Kanyakumari
- Smallest State (Population)-Sikkim
- Smallest State (Area)-Goa
- Largest State (Area)-Rajasthan
- Largest State (Population)-Uttar Pradesh
- Largest Cave Temple-Kailash Temple, Ellora (Maharashtra)
- Largest Port-Mumbai
- Largest Church-Saint Cathedral (Goa)
- Longest Beach-Marina Beach, Chennai
- Highest Airport-Leh (Ladakh)
- Largest River Island-Majuli (Brahmaputra River, Assam)

Tectonic Plate Theory:-

The theory describes the large scale motion of the earth's lithosphere. This theory is based on continental drift which explains the formation of various continents over millions of years; as we see them today.

Plate Boundaries:- Based on the relative movement between two tectonic plates, there are three types of plate boundaries. They are as follows:

Convergent Boundary: In this case, the two adjacent tectonic plates move towards each other.

Divergent Boundary: In this case, the two adjacent plates move away from each other.

Transform Boundary: In this case, the two adjacent plates move along their borders.

Formation of India

The Indian Peninsula drifted towards the north and finally collided with the much larger Eurasian Plate. As a result of this

collision, the sedimentary rocks which were accumulated in the geosynclines (known as Tethys) got folded and formed the mountain systems of the West Asia and Himalaya. Due to the uplift of the Himalayas in the Tethys Sea, the northern flank of the Indian Peninsula got subsided and formed a large basin. That basin was filled with sediments from the rivers which came from the mountains in the north and from the peninsula in the south. Thus, an extensive flat land of alluvial soil was formed which is known as the northern plains of India.

Major Mountain Ranges of the World

- **Andes** -South America
- **Himalayas** -Karakoram-Hindukush -South Central Asia
- **Rockies** -North America
- **Great Dividing Range** -East Australia
- **Western Ghats** -Western India-
- **Caucasus Europe** , -Asia
- **Alaska** -USA
- **Alps** -Europe
- **Apennines** -Europe
- **Ural** -Asia
- **Pennines** -Europe
- **Pyrenees** -Europe-
- **Appalachian** -North America



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HIMALAYAS

- **Punjab Himalaya** -Between Indus and Satluj
- **Kumaon Himalaya** -Between Satluj and Kali
- **Nepal Himalaya** -Between Kali and Tista
- **Assam Himalaya** -Between Tista and Dihang

IMPORTANT LAGOONS AND LAKES

- **VEMBNAD LAKE** -Kerala -Large sized lagoons
- **KAYALS** -Kerala -Popularly called back water in Kerala. Peaty soils of backwaters are called Kari in Kerala.
- **CHILKA LAKE** -Orissa--south west of the Mahanadi Delta.
- **WULAR LAKE** :Jammu and Kashmir-Largest fresh water lake of India
- **KOLLERU LAKE** : Andhra Pradesh
- **PULICAT LAKE** : Andhra Pradesh
- **JAISAMAND LAKE** : Rajasthan-Largest fresh water lake of Rajasthan
- **NAKKI LAKE** :Rajasthan-small natural lake near Mt. Abu surrounded by hills important as tourist place.
- **LOKTAK LAKE** : Manipur

SALINE WATER LAKES:

SAMBHAR LAKE -Rajasthan-Largest Lake of Rajasthan lies on the border of Jaipur and Nagaur District.

DEEDWANA LAKE : Rajasthan

Green Revolution

- To increase yield per hectare government of India introduced a programme called Green Revolution.
- The Green Revolution (first) was launched in 1967-68.
- Father of Green Revolution - Dr. Norman Borlaug
- Father of Green Revolution in India - Dr. M.S. Swaminathan
- Green Revolution focused the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure,

and distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers.

White Revolution

- The White Revolution in the country has been achieved by means of Operation Flood. It was carried out in three phases.
Operation Flood I 1970 - 1981
Operation Flood II ... 1981 - 1985
Operation Flood III ... 1985 - 1996.
- White revolution launched to increase the quality and quantity of milk and dairy products.
- The Father of the White Revolution in India is Dr. Varghese Kurien. He is also known as **Milkman of India.**

REMEMBER

- **National animal**-Royal Bengal Tiger
- **National aquatic animal**-Dolphin
- **National bird**-Indian Peacock
- **National tree**-Banyan tree

Riverside Cities - India

- **Agra**- Yamuna-Uttar Pradesh
- **Ahmedabad**- Sabarmati -Gujarat
- **Ayodhya**- Sarayu- Uttar Pradesh
- **Badrinath**- Ganga- Uttrakhand
- **Cuttack**- Mahanadi- Orissa
- **Delhi**- Yamuna- Delhi
- **Dibrugarh**-Brahmaputra -Assam
- **Haridwar**-Ganga--Uttaranchal
- **Hyderabad**-- Musi-- AP
- **Jabalpur**-- Narmada-- MP
- **Kanpur**-- Ganga-- Uttar Pradesh
- **Kolkata**-- Hoogly-- West Bengal
- **Kota**-- Chambal-- Rajasthan
- **Lucknow**--Gomti--Uttar Pradesh
- **Ludhiana**--Sutlej--Punjab
- **Nasik**--Godavari--Maharashtra
- **Pandharpur**--Bhima--Maharashtra
- **Patna**--Ganga--Bihar
- **Rajahmundry**--Godavari-Andhra P
- **Sambalpur**--Mahanadi-- Orissa
- **Srinagar**--Jhelum-- J&K
- **Surat**--Tapti--Gujarat
- **Tirucharapallil**--Kaveri--Tamil Nadu
- **Varanasi**-Ganga--Uttar Pradesh
- **Vijayawada**--Krishna-Andhra Pradesh

First Ranked States in Mineral Wealth (INDIA)

1. Coal—Jharkhand
2. Bauxite (Aluminium Ore)—Orissa
3. Chromite (Chromium ore)—Orissa
4. Iron Ore—Orissa
5. Manganese—Orissa
6. Lead & Zinc—Rajasthan
7. Calcite (source of marble)—Rajasthan
8. Gypsum (used in fertiliser, plaster of paris etc.)—Rajasthan
9. Quartz—Rajasthan
10. Asbestos—Andhra Pradesh
11. Limestone—Andhra Pradesh
12. Mica —Andhra Pradesh
13. Barytes (used as weighting agent for drilling fluids in oil & gas exploration, barium is used in CT Scan)—Andhra Pradesh

14. Diamond—Madhya Pradesh
15. Copper Ore—Madhya Pradesh
16. Gold—Karnataka
17. Corundum (source of ruby, sapphire)—Maharashtra
18. Rock Salt—Himachal Pradesh
19. Crude Oil—Gujarat
20. Natural Gas—Assam/Nagaland

India's Global Position in Mineral Wealth

1. Mica—First
2. Chromite—Second
3. Barytes—Second
4. Talc/Steatite/Pyrophyllite—Second
5. Coal and Lignite—Third
6. Bauxite—Third
7. Iron Ore—Fourth
8. Steel—Fourth
9. Zinc—Seventh
10. Copper—Eighth

Boundaries and Borders between Different Countries

- Boundary between Pakistan and Afghanistan - **Durand Line**
- Boundary between India and China - **McMahon Line**
- Line between India and Pakistan - **Radcliff Line**
- Line between North and South Vietnam - **17th Parallel**
- Line between North and South Korea - **38th parallel**
- Border between France and Germany - **Maginot Line**
- The line which Pakistan claims to be the boundary line between India and Pakistan (Not acceptable to India) - **20th parallel.**
- The border between USA and Canada - **49th Parallel**
- The border between Germany and Poland - **Oder-Neisse Line**
- Boundary between Germany and Poland - **Hindenburg Line**
- Boundary between Namibia and Angola - **16th Parallel**
- Boundary between Russia and Finland - **Mannerheim Line**

Minerals and Their Major Producer Countries

1. Bauxite - Australia, Bolivia, Nigeria
2. Coal - USA, China, Russia, Germany / Ruhr Basin
3. Copper - Zaire, Zambia, Canada
4. Diamond - South Africa
5. Gold - South Africa, Russia, Zaire, USA
6. Iron Ore - USA, Russia, China, Germany, India
7. Lignite - Germany, Russia
8. Manganese - Russia, India, South Africa
9. Mica - India, USA
10. Petroleum - Saudi Arabia, Iran, USA, Russia, Kuwait
11. Platinum - Canada, South Africa
12. Silver - Canada, Mexico
13. Thorium - India, USA, South Africa
14. Tungsten - Russia, China
15. Uranium - South Africa, USA

Continents of the World

World Continents

- Asia, Africa, North America, South America, Europe, Australia and Antarctica are the seven continents of the world.
- These seven continents were believed to be part of Pangaea which was a single landmass around 250 million years ago.

· Due to the tectonic movement, the landmass broke up and the component continents separated and moved away to its present position. All these took around 1 million years to complete.

The Continents of the World,

- Asia Continents Countries
- Africa Continents Countries
- North America Continents Countries
- South America Continents Countries
- Europe Continents Countries
- Australia Continents Countries
- Antarctica Continents Countries

ASIA

- 1) Area: 44,485,900 sq Kms
- 2) Straits Strait of Malacca, Bering Strait.

3) Mountains

Pamir Knot, Himalayas, Karakoram, Kunlun, Tien Shan, Altai, Hindu Kush, Elburz, Pontic, Sulaiman, Zagros, Taurus, Urals, Yablonovoi, Stanovoi.

- 4) Highest Point Everest (8,848 m)
- 5) Lowest Point Dead Sea (396.8 m)
- 6) **Islands**---Kurile, Sakhalin, Honshu, Hokkaido, Taiwan, Borneo, Sumatra, Java, Celebes, New Guinea, Philippines, Sri Lanka, Bahrain, Cyprus.
- 7) **Rivers**---Euphrates, Tigris, Indus, Ganga, Brahmaputra, Hwang-Ho, Yang-tse, Si-kiang, Amur, Lena-Yenisei, Ob, Irrawady, Salween, Mekong.
- 8) **Plateaus**---Anatolia Plateau, Plateau of Iran, Plateau of Arabia, Plateau of Tibet, Tarim Basin, Plateau of Mongolia, Plateau of Yunnan, Deccan Plateau.
- 9) **Peninsulas**---Kamchatka Peninsula, Peninsula of Korea, Peninsula of Indo-China, Malay Peninsula, Indian Peninsula, Arabian Peninsula.
- 10) Deserts---Arab, Thar

Africa

- 1 Area 30,259,680 sq Kms
- 2 Straits---Strait of Bab-el-Mandeb, Straits of Gibraltar
- 3 Mountains--- Atlas, Drakensberg, Kilimanjaro
- 4 Highest Point- Kilimanjaro (5,894 m)
- 5 Lowest Point-Lake Assai (-156.1 m.)
- 6 Islands---Madagascar, Cape Verde Islands, The Comoros, Mauritius, Seychelles
- 7 Plateaus---The whole continent is a plateau
- 8 Deserts---Kalahari, Sahara Namib

North America

- 1 Area-- 24,235,280 sq Kms
- 2 Straits--- Bering Strait
- 3 Mountains--- Rockies, Appalachians, Brooks, Kuskokwim, Alaska Range, Cascade Range, Coastal Range, Sierra Nevada, Sierra Madre
- 4 Highest Point-- McKinley (6,194 m.)
- 5 Lowest Point--Death Valley(-85.9 m)
- 6 Islands---Greenland, Baffin, Victoria, Newfoundland, Cuba, Jamaica, Haiti
- 7 Rivers---Mississippi, Missouri, St. Lawrence, Mackenzie, Colorado, Hudson, Potomac, Ohio
- 8 Plateaus--- Columbia Plateau, Colorado Plateau, Mexican Plateau, Canadian Shield.
- 9 Deserts---Chihuahuan, Colorado, Mojave, Sonoran

South America

- 1 Area-- 17,820,770 sq Kms

- 2 Straits-- Straits of Magellan
- 3 Mountains-- Andes
- 4 Highest Point- Aconcagua (6,960 m)
- 5 Lowest-Point Valdes Penin (-39.9 m)
- 6 Islands-Galapagos, Falkland, Tierra del Fuego.
- 7 Rivers--Amazon, Orinoco, Paraguay, Parana, Uruguay
- 8 Plateaus-- Plateau of Bolivia, Plateau of Ecuador
- 9 Deserts-- Atacama, Patagonia



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Europe

- 1 Area -- 10,530,750 sq Kms
- 2 Straits-- Straits of Gibraltar
- 3 Mountains-- Alps, Pyrenes, Appenines, Dinaric Alps, Carpathians, Transylvanian Mountains, Balkans, Caucasus, Urals
- 4 Highest Point-- Elbrus (5,663 M.)
- 5 Lowest Point--Caspian Sea (-28.0 m)
- 6 Islands--British Isles, Iceland, Sardinia, Sicily, Crete.
- 7 Rivers--Volga, Danube, Rhine, Po, Dnieper, Don, Vistula, Elbe, Oder, Seine, Loire, Garonne, Douro, Tagus, Ural
- 8 Plateaus--Plateau of Bohemia, Plateau of Spain, Central Massif

Australia

- 1 Area-- 7,830,682 sq Kms
- 2 Straits-- Bass Strait
- 3 Mountains-- Great Dividing Range
- 4 Highest Point-- Kosciusko (2,228 m.)
- 5 Lowest Point-- Lake Eyre (-15.8 m.)
- 6 Islands-- Tasmania
- 7 Plateaus-- Western Plateau
- 8 Deserts-- Gibson Desert, Great Sandy Desert, Great Victoria Desert, Simpson Desert.

EUROPE CONTINENT

1) Europe ranks sixth. Its boundaries are the Arctic Ocean in the west and the Mediterranean Sea in the South. In the east, it is separated from Asia by the Ural Mountains, the Caucasus mountains and the Caspian Sea.

- Reykjavik is also known as **The Smoking Bay**.
- Denmark is the smallest country of Scandinavia.
- Greenland the world's largest island and the Faroe islands also belong to Denmark.
- Copenhagen the capital of Denmark is known as **the key to the Baltic**.
- Finland is known as the **Land of Forests and Lakes**.
- The capital and the largest city of Finland, Helsinki is known as the **White city of the North**.
- Stockholm, the capital of Sweden is known as **Beauty on the Sea**.

- Milan (Italy) is known as the **Manchester of Italy**.
- Rome is known as **City of Seven Hills**
- Vatican city is the smallest Sovereign and an independent state of the world, which is completely surrounded by Italy.
- Highest point** - Mt. Elbrus, Russia
- Most Southerly point** - Gavdos, Greece
- Largest Lake** - L. Ladoga, Russia
- Largest river** – Volga
- Russia touches fourteen other countries and crosses eight time zones.
- Moscow is a part of five seas the Baltic Sea, Lake Ladoga, the Arctic Ocean, the Black sea and the Caspian Sea.
- Mt. Blanc is the highest peak of Alps (in France)
- Important mountain ranges of Europe include Alps, Pyrenees, the Carpathian and the Caucasus.
- The highest mountain peak of Europe, Mt. Elbrus is the Caucasus.
- In the South - East part of Europe, there is an extensive grassland called the Steppes.
- Rhine is the busiest inland waterway of Europe.
- British Isles is separated from the mainland of Europe by the English Channel.
- The Pyrenees mountains separate France from Spain.
- The Ruhr (Germany) is the biggest and the richest coal producing area of Europe.

NORTH AMERICA

- Central American countries are known as the **Banana Republic**.
- Hamilton is known as **the Pittsburgh of Canada**.
- Halifax, the capital of Nova Scotia is an important ice free port in Canada.
- Vancouver, the largest city of British Columbia, Canada situated near the mouth of Fraser river.
- 'Birmingham of Canada' - Hamilton.
- World's largest oil refinery located on Sarnia, Canada
- Smallest state of USA : Rhode Island
- Largest state of USA : Alaska
- Largest port in Pacific, also known as **City of Golden Gate**: San Francisco, USA
- Highest point - North America**
Mt. Mc Kinley, Alaska, USA
- Lowest Point**
Death valley, California
- Largest lake**
L. Superior, Canada/ USA
- Largest port in USA, situated on the bank of Hudson river - New York City.
- Most populated city of USA also known as **city of sky scrapers**- New York City.
- Mauna Kea, the highest peak in Hawaii is active as a volcano.
- Capital of Hawaii, Honolulu is known as **the cross roads of Pacific**.
- St. Lawrence is the busiest inland waterway in North America.
- The Grand Canyon of Colorado river is the largest of its kind in the world.
- The Grasslands found in the interior plains of North America are known as the **Prairies**.
- **Lake Superior** : World's second largest lake after Caspian Sea.
- **Lake Michigan** : Only Great lake that is entirely within the United States.
- World's leading coffee producer : Brazil
- Largest city of South America : Sao Paulo, Brazil
- Driest place in the world : Arica, Chile

- World's largest copper town : Chiquicamata, Chile
- **Pearl of the Pacific**: Guayaquil, Ecuador
- World's highest water fall : Angel falls, Venezuela
- Strait between South America and Antarctica : Drake Passage.
- Highest active volcano in the world : Mt. Ojas del Salado, Argentina
- Second highest mountain systems in the world next to the Himalayas : Andes
- Amazon basin is the home of the rubber tree.

AUSTRALIA

- Australia is the smallest continent.
- It lies entirely in the Southern Hemisphere.
- Australia is the only country in the world that covers the entire continent.
- It is also known as **the Island Continent**.
- Tropic of Capricorn passes almost through the middle of the continent.
- Australia was discovered by captain James Cook, an English Seaman, in 1770.
- It is surrounded by Timor Sea in the northwest, Arafura sea and Gulf of Carpentaria in the north, Great Barrier Reef in the north east and Great Australian Bight in the South.

Highest point

Mt. Kosciusko, Australia

Lowest point : Lake Eyre, Australia

Largest Lake : Lake Eyre

- The Murray and the Darling are the major rivers of Australia.
- Tropical grasslands are called Savannas and the temperate grasslands found in the Murray Darling basin are called Downs.
- Sydney is the largest city and important sea port of Australia.
- Tasman sea separates Australia from New Zealand.

New Zealand is divided into two islands: The Northern Island and the Southern Island. Cook strait separates the two islands.

Wellington the Capital lies in the Northern Island.

ANTARCTICA

- Antarctica is Earth's southernmost continent, underlying the South Pole.
- It is situated in the Antarctica region of the southern hemisphere, almost entirely south of the Antarctic Circle, and is surrounded by the Southern Ocean.

Highest point : Vinson Massif, 4,897 m

Lowest point : Bentley Subglacial Trench, -2,555 m

Longest river : Onyx River, 25 km

OTHER IMPORTANT FACTS

THE ANTARCTIC TREATY

- The Antarctic Treaty was signed in 1959 by twelve countries and officially entered into force on June 23rd, 1961.
- The twelve countries had significant interests in Antarctica at the time: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States.
- Forty-six countries have signed the treaty.
- The treaty prohibits military activities and mineral mining, supports scientific research, and protects the continent's eco zone.

FACTS 2

Largest total area ... Russia, 17,098,242 km²

Largest land area... Russia, 17,075,200 km²

Largest water area... Canada, 891,163 km²

Longest coastline ... Canada, 243,792 km

Highest coastline to area ratio ...Micronesia, 8,706.553 m/km²

Most countries bordered: ...Russia and China

Largest forest area ... Russia, 8,087,900 km²

Hottest, Coldest, Driest, Wettest

Hottest Place Dalol, Denakil Depression, Ethiopia, annual average temperature (93.2°F, 34°C)

Coldest Place Plateau Station, Antarctica, annual average temperature (-56.7°C)

Wettest Place Mawsynram, Assam, India, annual average rainfall (11,873 mm, 467.4")

Driest Place Atacama Desert, Chile, imperceptible rainfall on a yearly basis.



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Important mountain ranges

Andes --- South America
Rockies --- North America
Atlas --- Africa
Kilimancharo --- Africa
Appalachian --- America
Ural --- Europe
Alps --- Europe
Karthyan --- Europe
Mount Eribo --- Antarctica
Himalayas --- Asia

VOLCANOES

Important volcanoes

Vezuvius --- Italy
Etna --- Italy
Stromboli --- Italy
Barren --- India (Andaman Nicobar)
Kilimancharo --- Tanzania
Krakatoe --- Indonesia
Pinatubo --- Philippines
• Most of the volcanoes found near Pacific Ocean
• Ring of fire - Pacific
• Lighthouse of the Pacific - Ezalko
• Lighthouse of the Mediterranean - Stromboli

DESERTS

Fossil desert --- Kalahari
Little Sahara --- Australia
Death desert --- Thakkala Makkan
Painted desert --- North America
Coldest desert --- Gobi
Warmest desert --- Sahara
Driest desert --- Atakkama
Great Indian desert --- Thar

Important Deserts

Roob Asavali	--- Asia
Atakkama	--- South America
Sahara	--- Africa
Kalahari	--- Africa
Nameeb	--- Nameebia
Great Sandy	--- Australia
Great Victoria	--- Australia

Thakkala Makkan
Sahel
Thar

--China
--China
-- India

ISLANDS

Island of the volcanoes	--- Iceland
Island of the tortoise	--- Galapagos
Island of the Sailors	--- Samoa
Island of the inspiration	--- Tasmania
Pearl of the Antilles	--- Cuba
Friendly island	--- Tonga
Spring island	--- Jamaica
Birthplace of Napoleon	--- Kozhikode Island
Biggest island	--- Greenland
Smallest island nation	--- Navru
• Falkland islands, Canary islands, Kozhikode, St. Helena, Bahamas Bermuda islands situated in Atlantic Ocean.	

LAKES

Important Lakes

Superior	--- North America
Ladol	--- Europe
Caspian	--- Asia
Victoria	--- Africa
Ayar	--- Australia
Marakkoiba	--- South America
Vozthok	--- Antarctica
Azad	--- Syria
Nazar	--- Egypt
• Land of ten thousand lakes	--- Minnesota
• Land of thousand lakes	--- Finland
• Oldest lake, Deepest lake	--- Baikal (Russia)
• Largest Island Lake	--- Manitowlin
• Largest freshwater lake	--- Superior
• Largest salt water lake	--- Caspian sea
• Largest artificial lake	--- Volta (Ghana)

TRIBAL GROUPS

1. **Abhors:** People of Mongoloid stock living in the north-eastern parts of India.
2. **Adivasis:** Tribals of Bastar district, Chhattisgarh.
3. **Angami:** Tribals of Nagaland.
4. **Apatanis:** Tribals of Arunachal Pradesh.
5. **Badagas:** Tribals of Nilgiri region in Tamil Nadu.
6. **Baiga:** Tribals of Madhya Pradesh.
7. **Bakkarwals:** People of Jammu and Kashmir who rear sheep and goats.
8. **Bhils:** People of Dravidian stock now living in central India (MP) and Rajasthan.
9. **Bhotias:** Tribals of Garhwal and Kumaon region in Uttaranchal, Sikkim and West Bengal.
10. **Birhors:** A tribal group of Madhya Pradesh, Chhattisgarh, Jharkhand and Orissa.
11. **Chenchus:** Tribals of Andhra Pradesh.
12. **Caddis:** Tribals of Himachal Pradesh who rear sheep.
13. **Garos:** Hill tribe of Meghalaya and Assam.
14. **Gonds:** Tribals inhabiting forests in Madhya Pradesh, Jharkhand, Andhra Pradesh and Orissa.
15. **Gujjars:** Animal rearers of Jammu and Kashmir and Himachal Pradesh.
16. **Jaintias:** Hill tribe of Meghalaya and Assam.
17. **Jarawas:** One of the oldest tribes of Andaman and Nicobar Islands inhabiting Little Andamans.
18. **Khasa:** Tribals of Jansar Bhabar region in Uttaranchal.
19. **Khasis:** Hill tribe of Meghalaya and Tripura.

20. **Khonds:** Tribals inhabiting parts of Orissa.
21. **Kol :** Tribals of Madhya Pradesh and Maharashtra.
22. **Kotas:** Tribals of Nilgiri Hills in Tamil Nadu.
23. **Kuki:** A tribe of Manipur, Assam, Nagaland and Tripura.
24. **Lahaulas:** Tribals inhabiting Lahaul region in Himachal Pradesh.
25. **Lepchas:** Original tribal inhabitants of Sikkim.
26. **Lushai:** Tribals of Mizoram and Tripura.
27. **Murias:** Tribals of Bastar district of Madhya Pradesh.
28. **Mikirs:** A tribal group of Assam.
29. **Moplahs:** Muslims of the Malabar district in Kerala.
30. **Munda:** A tribe of Jharkhand, West Bengal, Orissa, Tripura and Chhattisgarh.
31. **Nagas:** Tribals of Nagaland.
32. **Oraon:** Tribals inhabiting parts of Jharkhand, Chhattisgarh, Orissa and West Bengal.
33. **Onges:** One of the tribes of Andaman and Nicobar Islands.
34. **Santhals:** Tribals living in West Bengal, Jharkhand and Orissa.
35. **Scntinelcse:** One of the small statured tribes of Andaman and Nicobar Islands.
36. **Shompens:** Another tribal group of Andaman and Nicobar Islands.
37. **Todas:** Tribals of the Nilgiri Hills.
38. **Uralis:** Tribals inhabiting parts of Kerala.
39. **Varlis:** Tribals of Maharashtra, Gujarat and Dadra & Nagar Haveli.


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Highest Mountain Peaks

Name	Height in metres	Range	Date of avoid ascent
1. Mount Everest	8,848	Himalayas	May 29, 1953
2. K-2 (Godwin Austen)	8,610	Karakoram	July 31, 1954
3. Kanchenjunga	8,597	Himalayas	May 25, 1955
4. Lhotse	8,511	Himalayas	May 18, 1956
5. Makalu I	8,481	Himalayas	May 15, 1955

Highest Volcanoes

Name	Height (in metres)	Range or location	Location
1. Ojos del Salado	6,885	Andes	Argentina-Chile
2. Gullatiri	6,060	Andes	Chile
3. Cotopaxi	5,897	Andes	Ecuador
4. Lascar	5,641	Andes	Chile
5. Tupungatito	5,640	Andes	Chile

largest Deserts

Name	Approximate area in sq. km	Territories
1. Sahara	8,400,000	Algeria, Chad, Libya, Mali, Mauritania, Niger, Sudan, Tunisia, Egypt, Morocco.
2. Australian	1,550,000	Australia
3. Arabian Desert	1,300,000	Southern Arabia, Saudi Arabia, Yemen
4. Gobi	1,040,000	Mongolia and China (Inner Mongolia)
5. Kalahari Desert	520,000	Botswana

largest Islands

Name	Location and status	Area in sq. km.
1. Greenland (Kalaallit Nunaat)	North Atlantic (Danish)	2,175,597
2. New Guinea	Southwest Pacific (Irian Java, Indonesian, west part; Papua New Guinea, east part)	820,033
3. Madagascar	Indian Ocean (Malagasy Republic)	587,042
4. Baffin	North Atlantic (Canadian)	476,068
5. Sumatra	North-east Indian Ocean (Indonesian)	473,605

Deepest Sea Trenches

Name	Length in km	Deepest point	Depth in metres
1. Mariana Trench (West Pacific)	2,250	Challenger Deep	11,776
2. Tonga-Kermadec Trench (South Pacific)	2,575	Vityaz 11 (Tonga)	10,850
3. Kuril-Kamchatka Trench (West Pacific)	2,250		10,542
4. Philippine Trench (Wet Pacific)	1,325	Galathea Deep	10,539
5. Idzu Bonin Trench (sometimes included in the Japan Trench)			9,810

largest Rivers

Name	Source	Outflow	Length in km
1. Nile	Lake Victoria, Africa	Mediterranean Sea	6,690
2. Amazon	Glacier-fed lakes, Peru	Atlantic Ocean	6,296
3. Mississippi-Missouri	Red Rock, Montana (USA)	Gulf of Mexico	6,240
4. Yangtze Kiang	Tibetan Plateau, China	China Sea	5,797
5. Ob	Altai, Mts, Russia	Gulf of Ob	5,567

largest Lakes (Natural)

Name and Location	Area in sq km	Length in km	Maximum depth in metres
1. Caspian Sea, CIS-Iran	394,299	1,199	946
2. Superior, USA-Canada	82,414	616	406
3. Victoria, Tanzania-Uganda	69,485	322	82
4. Aral, CIS	66,457	428	68
5. Huron, USA-Canada	59,596	397	229

Highest Waterfalls

Waterfall	Location	River	Height in metres
1. Angel	Venezuela	Tributary of Carnol	972
2. Tugela	Natal, South Africa	Tugela	914
3. Cuquenán	Venezuela	Cuquenán	610
4. Sutherland	South Island, New Zealand	Arthur	580
5. Takakaw	British Columbia	Tributary of Yoho	503

Biggest Countries (In Area)

Name	Area (sq km)	Location
1. Russia (Yosemite)	17,075,000	Europe-Asia
2. Canada	9,976,139	North America
3. China	9,561,000	Asia
4. USA	9,372,614	North America
5. Brazil	8,511,965	South America

Smallest Countries (In Area)

Name	Area (sq. Km)	Location
1. Vatican City	0.44	Europe
2. Monaco	1.95	Europe
3. Nauru	21.10	South Pacific
4. Tuvalu	26.00	South Pacific
5. San Marino	61.00	Europe

Large Peninsulas

Name	Area in sq km	Name	Area in sq km
Arabia	3,250,000	Labrador	1,300,000
Southern India	2,072,000	Scandinavi	800,300
Alaska	1,500,000	Iberian Peninsula	584,000

Continents - Data

Name	Percentage of earth's area	Area in sq km	Population (million)
Asia	29.5	43,998,000	3513.2
Africa	20.0	29,800,000	748.1
North America	16.3	21,510,000	295.7
South America	11.8	17,598,000	325.1
Europe	6.5	9,699,550	727.7
Australia	5.2	7,699,000	18.3
Antarctica	9.6	13,600,000	18.3

Note : Australia with New Zealand, Tasmania, New Guinea and the Pacific Islands (Micronesia, Melanesian and Polynesian islands) is called Australasia by some geographers while some others call it Oceania.

Continents - Highest and Lowest Points

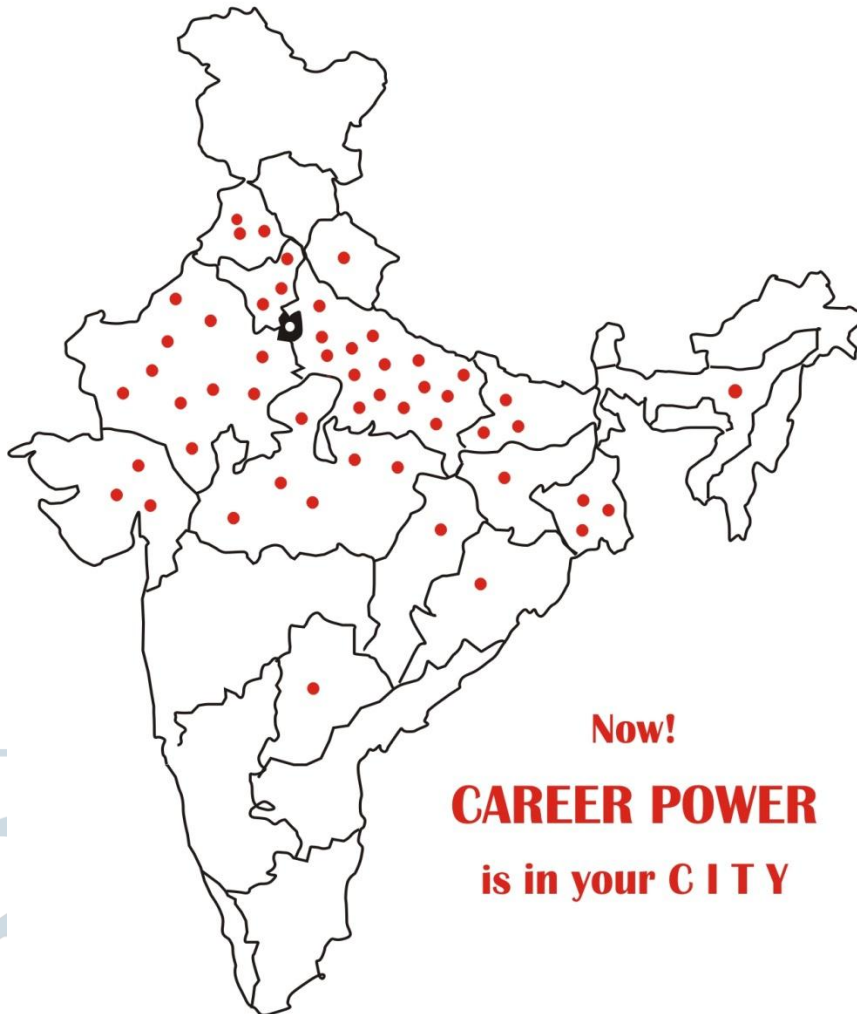
Continents	Highest point	in metres	Lowest points in metres (from sea-level)
Asia	Everest	8,848	Dead Sea -396.8
Africa	Kilimanjaro	5,894	Lake Assai -156.1
North America	Mckinley	6,194	Death Valley -85.9
South America	Aconcagua	6,960	Valdes Penin -39.9
Europe	Elbrus	5,663	Caspian Sea -28.0
Australia	Koschusko	2,228	Lake Eyre -15.8
Antarctica	Vinson Massif	5,140	-



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